Techniques et Outils pour le Développement Logiciel

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Material

http://mathieuacher.com/teaching/PDL/

Multi-Tools and Languages

Visual Basic

Code::Blocks Studio

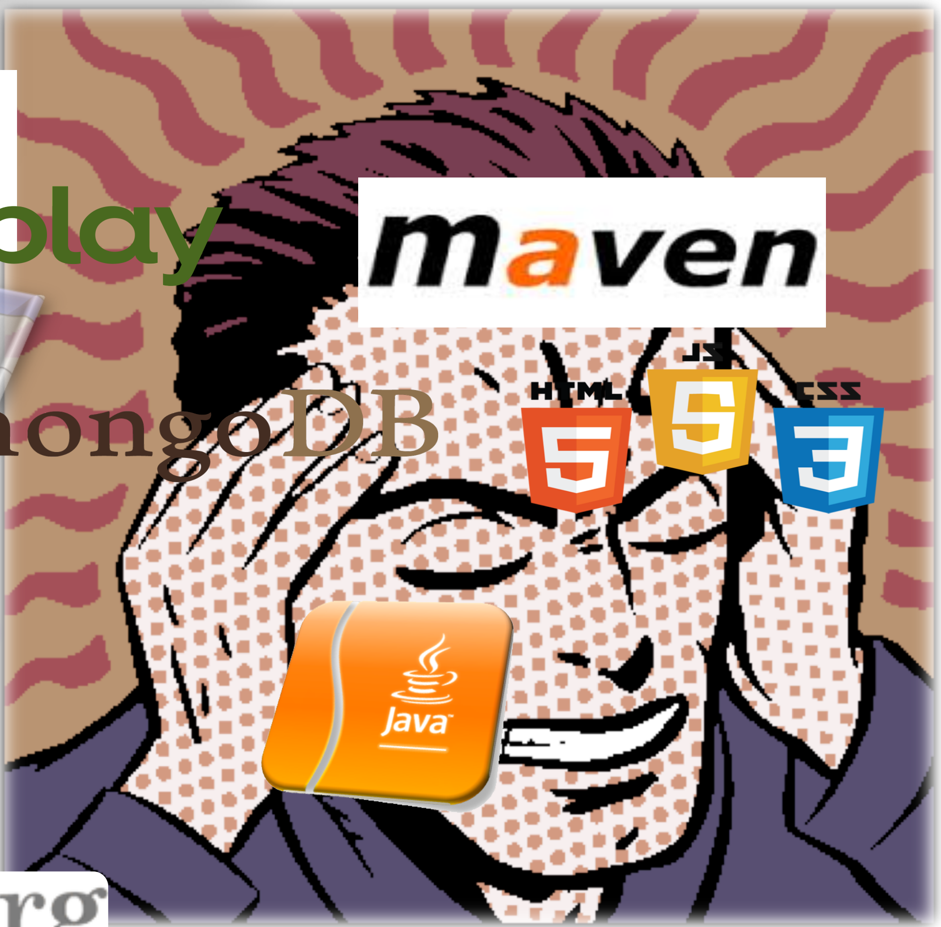
eclipse

Microsoft® Visual Studio®

play

Method Summary

mongoDB



maven

HTML 5 JS 5 CSS 3

Java

SUBVERSION

git

CVS

node JS™

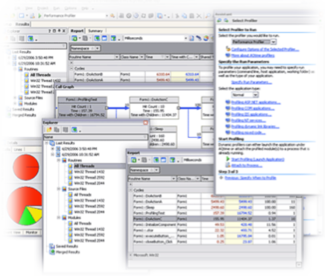
http://logging.apac

Logging Service

LOG4J™

<APACHE ANT>

JUnit.org



Today

- Build System (maven)
- Manage your source code
- Refactoring
- Logging, Debugging and Test
- IDE (eg, Eclipse)
- Workflow: git, intégration continue, et tous les points ci-dessous

Today

- Tools and techniques are useful for your project and have to be used
  - Logging, Test, Build system, IDE
- Objectives:
  - Why these tools/techniques exist?
  - Presentation
    - First: independent of any technology
    - and then describe specific solutions

Today

- Build System (maven)
- Manage your source code
- Refactoring
- Logging, Debugging and Test
- IDE (eg, Eclipse)
- Workflow: git, intégration continue, et tous les points ci-dessous

Maven

```
PACKAGE      = package
    VERSION      = ` date "+%Y.%m%d%" `
    RELEASE_DIR  = ..
    RELEASE_FILE = $(PACKAGE)-$(VERSION)

    # Notice that the variable LOGNAME comes from the environment in
    # POSIX shells.
    #
    # target: all - Default target. Does nothing.
    all:
            echo "Hello $(LOGNAME), nothing to do by default"
            # sometimes: echo "Hello ${LOGNAME}, nothing to do by default"
            echo "Try 'make help'"

    # target: help - Display callable targets.
    help:
            egrep "^# target:" [Mm]akefile

    # target: list - List source files
    list:
            # Won't work. Each command is in separate shell
            cd src
            ls

            # Correct, continuation of the same shell
            cd src; \
            ls
```

Make/Makefile

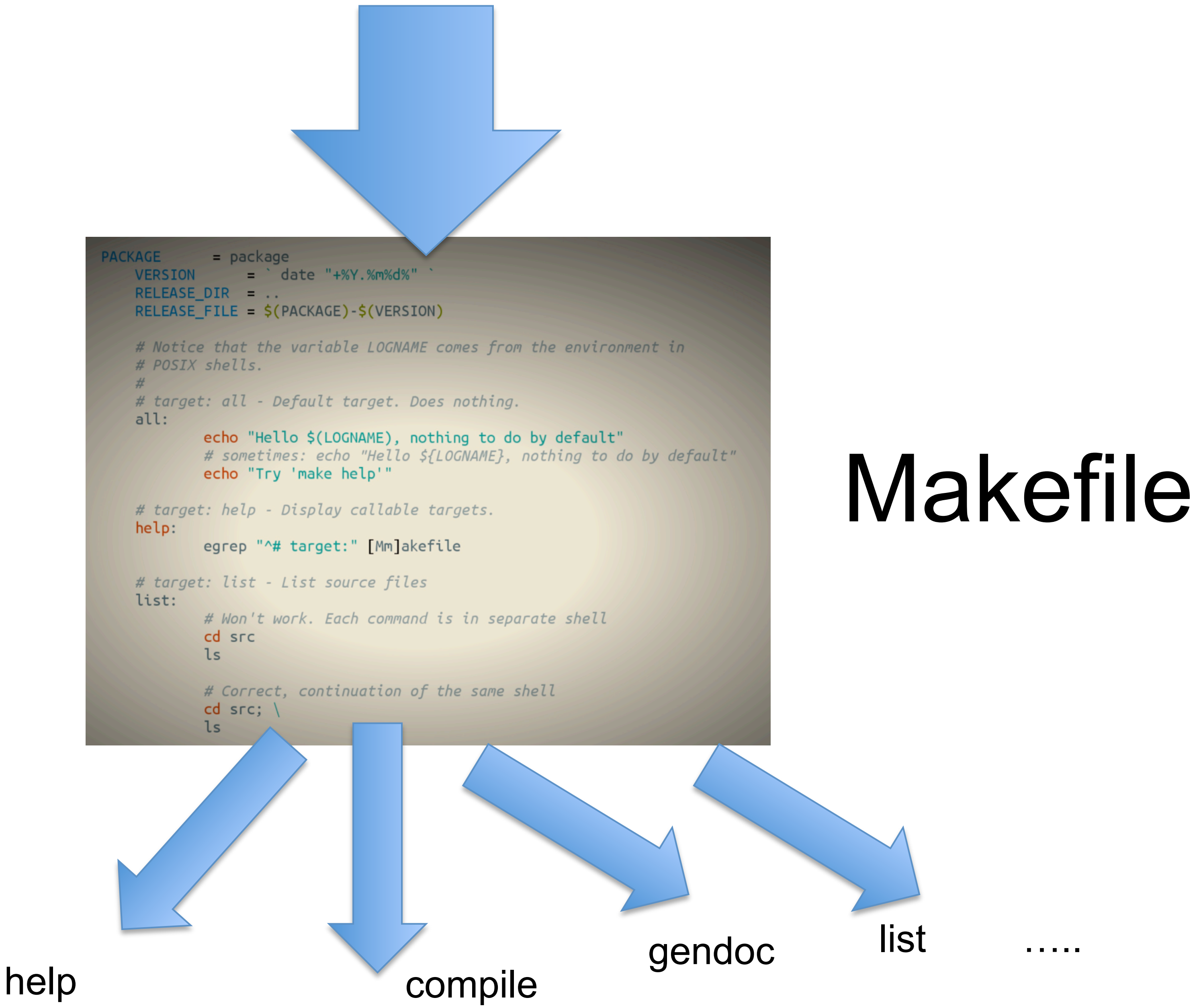
Original problem: compiling your source code files can be tedious!

- several source files
- type the compiling commands everytime

Make for increasing automation, avoiding accidental complexity, and have more flexibility when « compiling » projects

(initial release in 1977)

Make



```
PACKAGE       = package
    VERSION       = ` date "+%Y.%m%d%" `
    RELEASE_DIR   = ..
    RELEASE_FILE = $(PACKAGE)-$(VERSION)

    # Notice that the variable LOGNAME comes from the environment in
    # POSIX shells.
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            echo "Hello $(LOGNAME), nothing to do by default"
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            echo "Try 'make help'"

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            cd src
            ls

            # Correct, continuation of the same shell
            cd src; \
            ls
```
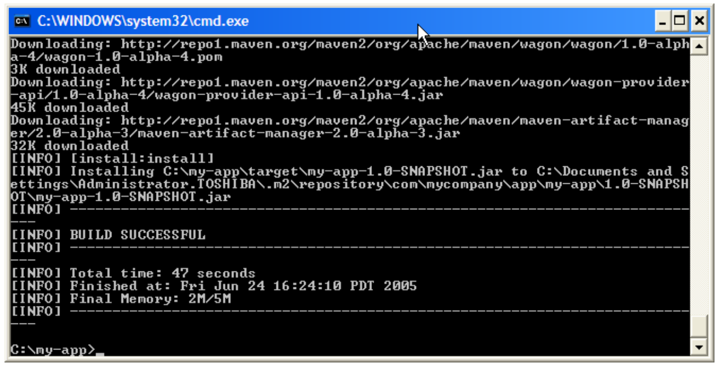

Compile chain

- Sometimes hidden in the IDE
  - But generally speaking, you need to master your “compile” chain
- Tools
  - make, gmake, nmake (Win),
  - Apache ANT, Apache **MAVEN**, Freshmeat 7Bee ...
- To **automate**:
  - pre-compilation, obfuscation, verification
  - generation of .class and .jar
    - normal, tracing, debug, …
  - documentation generation
  - « stubs » generation (rmic, idl2java, javacard …)
  - test
  - 3rd party libraries/dependencies

… And a **combination** of all these tasks

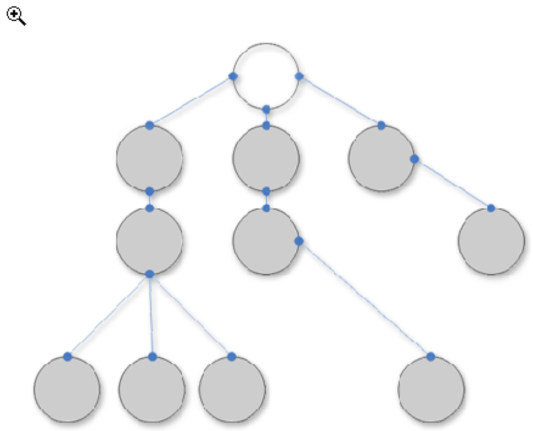
What is Maven?

A build tool

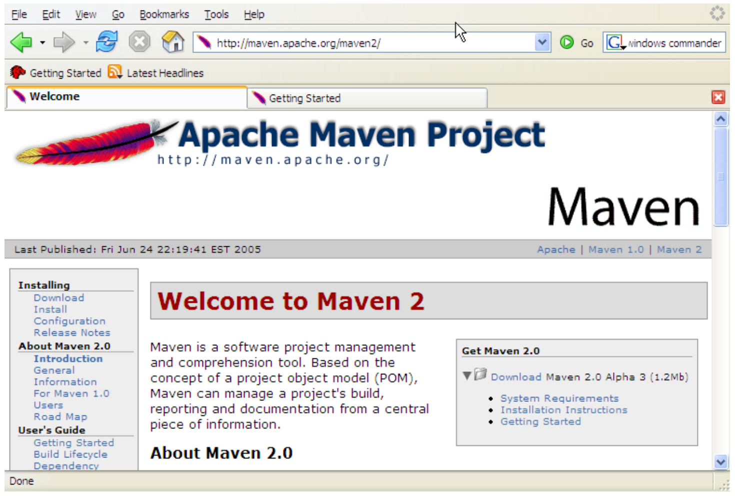


```
Downloading: http://repo1.maven.org/maven2/org/apache/maven/wagon/wagon/1.0-alph
a-4/wagon-1.0-alpha-4.pom
3K downloaded
Downloading: http://repo1.maven.org/maven2/org/apache/maven/wagon/wagon-provider
-api/1.0-alpha-4/wagon-provider-api-1.0-alpha-4.jar
45K downloaded
Downloading: http://repo1.maven.org/maven2/org/apache/maven/maven-artifact-manag
er/2.0-alpha-3/maven-artifact-manager-2.0-alpha-3.jar
32K downloaded
[INFO] [install:install]
[INFO] Installing C:\my-app\target\my-app-1.0-SNAPSHOT.jar to C:\Documents and S
ettings\Administrator.TOSHIBA\.m2\repository\com\mycompany\app\my-app\1.0-SNAPSH
OT\my-app-1.0-SNAPSHOT.jar
[INFO] ------------------------------------------------------------------------
----
[INFO] BUILD SUCCESSFUL
[INFO] ------------------------------------------------------------------------
----
[INFO] Total time: 47 seconds
[INFO] Finished at: Fri Jun 24 16:24:10 PDT 2005
[INFO] Final Memory: 2M/5M
[INFO] ------------------------------------------------------------------------
----

C:\my-app>_
```

A dependency management tool



A documentation tool



Last Published: Fri Jun 24 22:19:41 EST 2005 Apache | Maven 1.0 | Maven 2

Installing
- Download
- Install
- Configuration
- Release Notes

About Maven 2.0
- Introduction
- General Information
- For Maven 1.0 Users
- Road Map

User's Guide
- Getting Started
- Build Lifecycle
- Dependency

Welcome to Maven 2

Maven is a software project management and comprehension tool. Based on the concept of a project object model (POM), Maven can manage a project's build, reporting and documentation from a central piece of information.

About Maven 2.0

Get Maven 2.0

Download Maven 2.0 Alpha 3 (1.2Mb)
- System Requirements
- Installation Instructions
- Getting Started

Apply patterns to project build infrastructure

Maven is really a process of applying **patterns** to a build infrastructure in order to provide a coherent view of software projects.

Provides a way to help with managing:

- Builds
- Documentation
- Reporting
- Dependencies
- Software Configuration Management
- Releases

Objectives

- Make the development process visible or transparent
- Provide an easy way to see the health and status of a project
- Decreasing training time for new developers
- Bringing together the tools required in a uniform way
- Preventing inconsistent setups
- Providing a standard development infrastructure across projects
- Focus energy on writing applications

Benefits

- Standardization
- Fast and easy to set up a powerful build process
- Greater momentum vs. Ant – it is now becoming legacy and not moving fast ahead.
- Dependency management (automatic downloads)
- Project website generation, Javadoc
- Repository management
- Extensible architecture

Maven and POM

aka project's configurations

```
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/
XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/
maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1.0-SNAPSHOT</version>
  <packaging>jar</packaging>

  <name>Maven Quick Start Archetype</name>
  <url>http://maven.apache.org</url>

  <dependencies>
    <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>4.8.2</version>
      <scope>test</scope>
    </dependency>
  </dependencies>
</project>
```

Kind of packaging

JUnit.org

Maven facilities and lifecycle

validate: validate the project is correct and all necessary information is available
compile: compile the source code of the project
test: test the compiled source code using a suitable unit testing framework. These tests should not require the code be packaged or deployed
package: take the compiled code and package it in its distributable format, such as a JAR.
integration-test: process and deploy the package if necessary into an environment where integration tests can be run
verify: run any checks to verify the package is valid and meets quality criteria
install: install the package into the local repository, for use as a dependency in other projects locally
deploy: done in an integration or release environment, copies the final package to the remote repository for sharing with other developers and projects.

clean: cleans up artifacts created by prior builds

site: generates site documentation for this project

Build the Project

```
mvn package
```

Generating the Site

```
mvn site
```

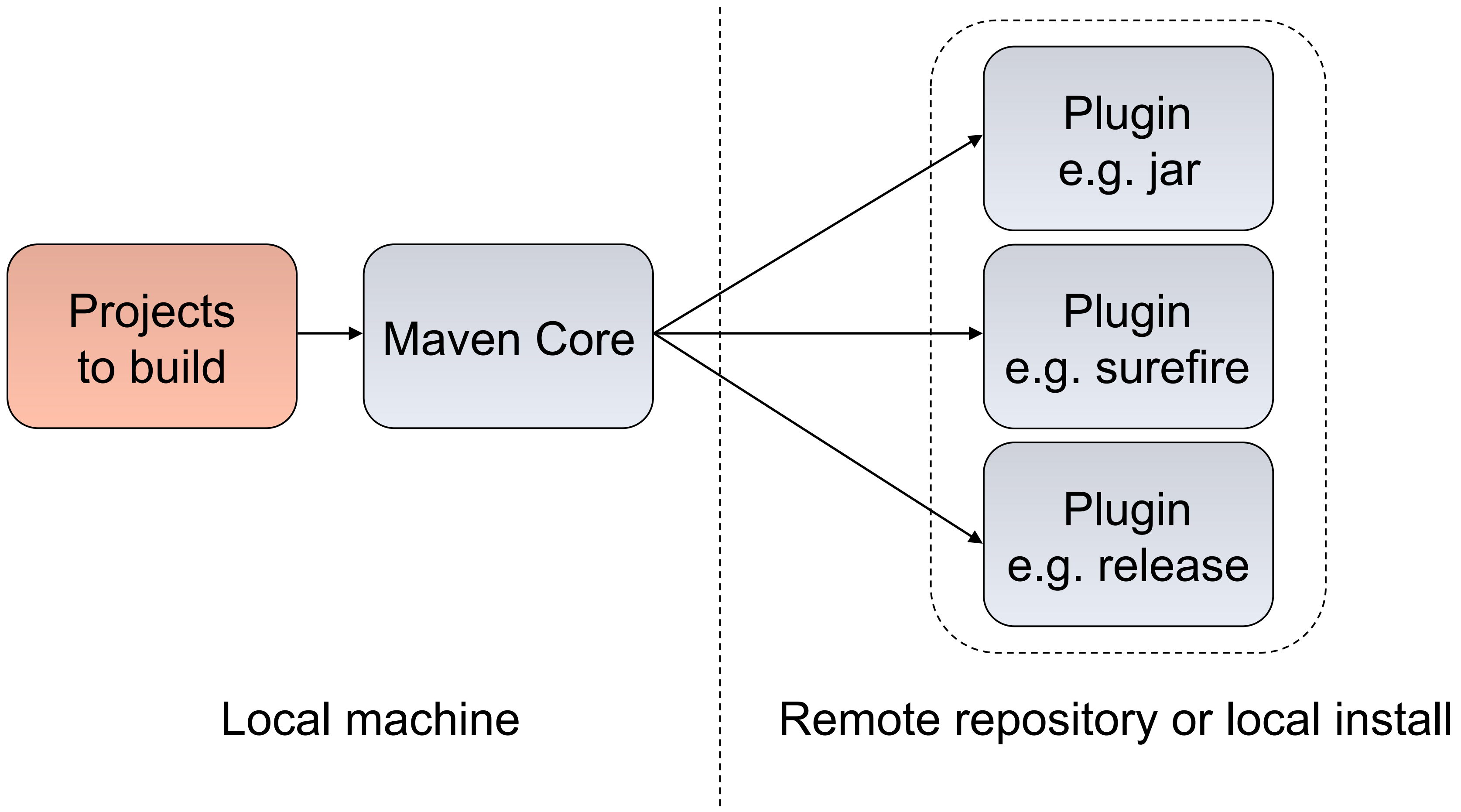
Maven

- Abstract project model (POM)
  - Object oriented, inheritance
  - Separation of concerns
- Default lifecycle
  - Default state (goals) sequence
    - plugins depend on states
- Give a project « standard » structure
  - Standard naming conventions
  - Standard lifecycle
- Automatic handling of dependencies between projects
  - Including updates
- Project repositories
  - public or private, local or remotes
  - caching and proxy
- Extensible via external plugins

Maven plugins

- Core
  - clean, compiler, deploy, install, resources, site, surefire, verifier
- Packaging
  - ear, ejb, jar, rar, war, bundle (OSGi)
- Reporting
  - changelog, changes, checkstyle, clover, doap, docck, javadoc, jxr, pmd, project-info-reports, surefire-report
- Tools
  - ant, antrun, archetype, assembly, dependency, enforcer, gpg, help, invoker, one (interop Maven 1), patch, plugin, release, remote-resource, repository, scm
- IDEs
  - eclipse, netbeans, idea
- Others
  - exec, jdepend, castor, cargo, jetty, native, sql, taglist, javacc, obr …

Maven Architecture



Common project metadata format

- POM = Project Object Model = pom.xml
- Contains metadata about the project
  - Location of directories, Developers/Contributors, Issue tracking system, Dependencies, Repositories to use, etc
- Example:

```
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>org.codehaus.cargo</groupId>
  <artifactId>cargo-core-api-container</artifactId>
  <name>Cargo Core Container API</name>
  <version>0.7-SNAPSHOT</version>
  <packaging>jar</packaging>
  <dependencies/>
  <build/>
[…]
```

Minimal POM

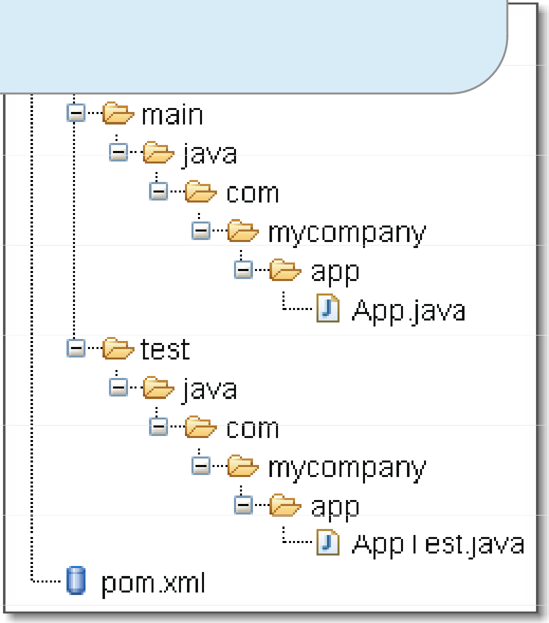
Use Inheritance

Standard directory organization

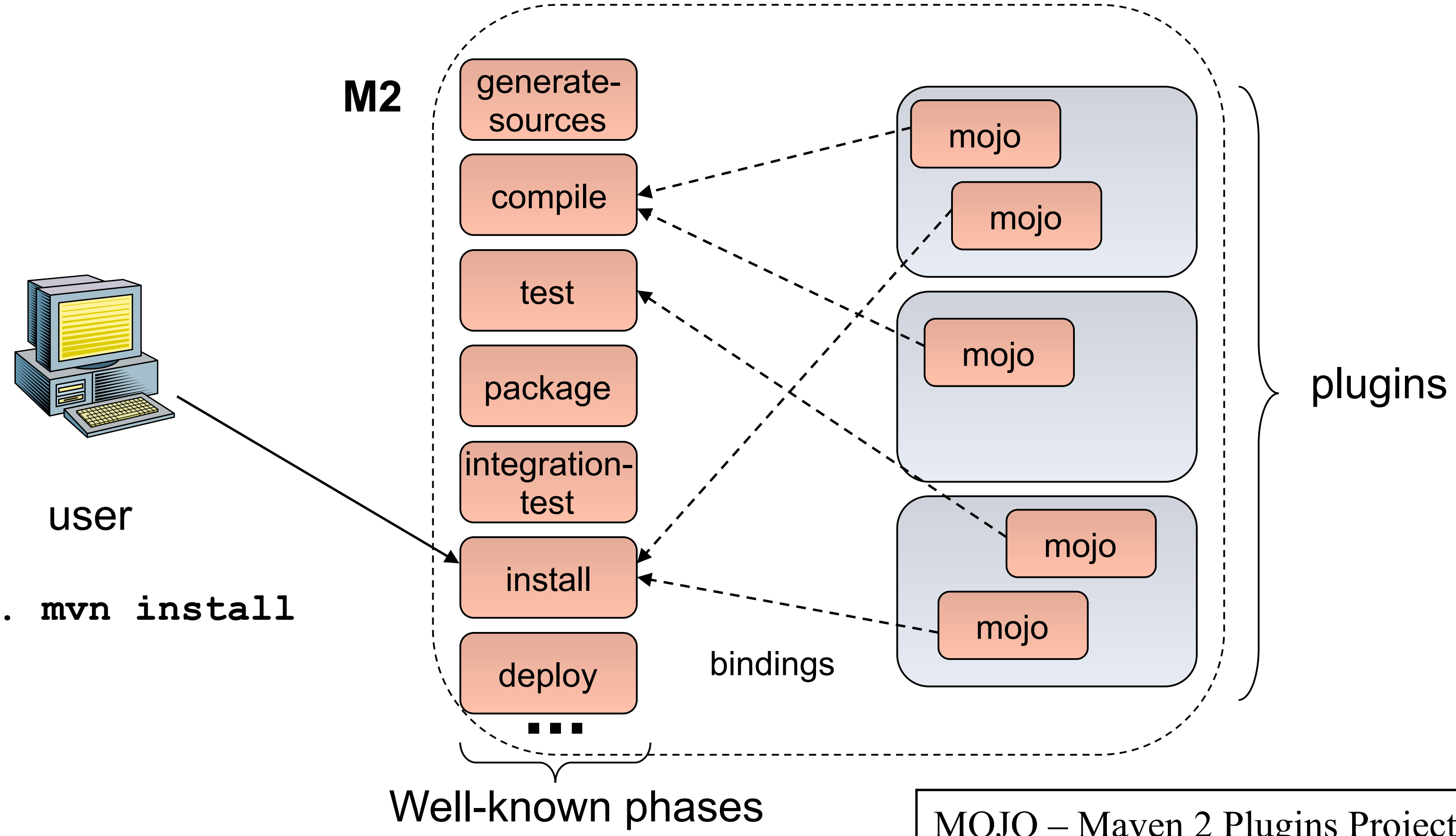
- Having a common directory layout would allow for users familiar with one Mav ther Maven projec

Convention over configuration

src/main/java	
src/main/resources	
src/main/filters	
src/main/assembly	Assembly des
src/main/config	Configurati
src/main/webapp	Web appl es
src/test/java	Test so
src/test/resources	Test r sources
src/test/filters	Test resource filter files
src/site	Site
LICENSE.txt	Project's license
README.txt	Project's readme



Common way to build applications

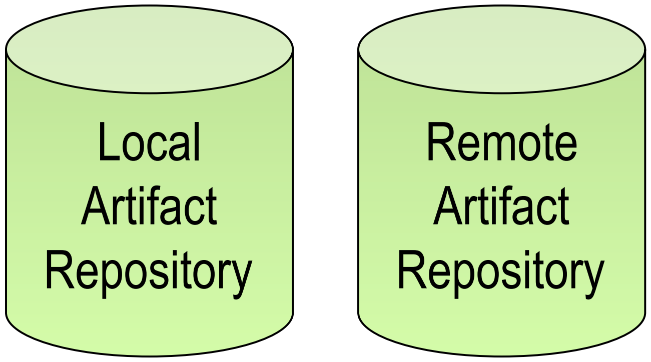


```
e.g. mvn install
```

MOJO – Maven 2 Plugins Project
`http://mojo.codehaus.org/`

Artifact repositories (1/3)

- Used to store all kind of artifacts
  - JARs, EARs, WARs, NBMs, EJBs, ZIPs, plugins, …
- *All* project interactions go through the repository
  - No more relative paths!
  - Easy to share between team

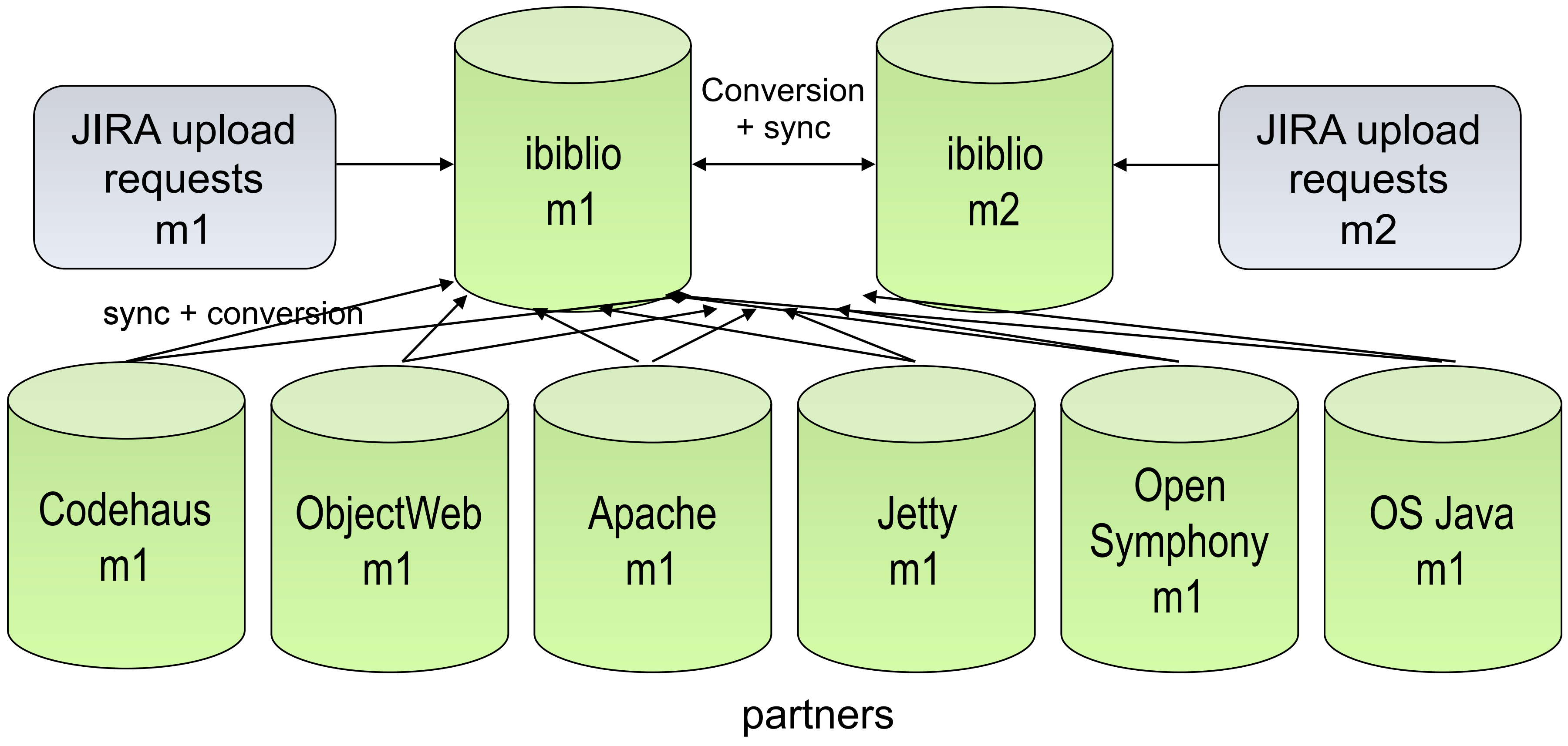


e.g. `http://ibiblio.org/maven2`

```
<repositories>
  <repository>
    <id>maven2-snapshot</id>
    <releases>
      <enabled>true</enabled>
    </releases>
    <name>Maven Central Development Repository</name>
    <url>http://snapshots.maven.codehaus.org/maven2</url>
    <layout>legacy|default</layout>
  </repository>
</repositories>
```

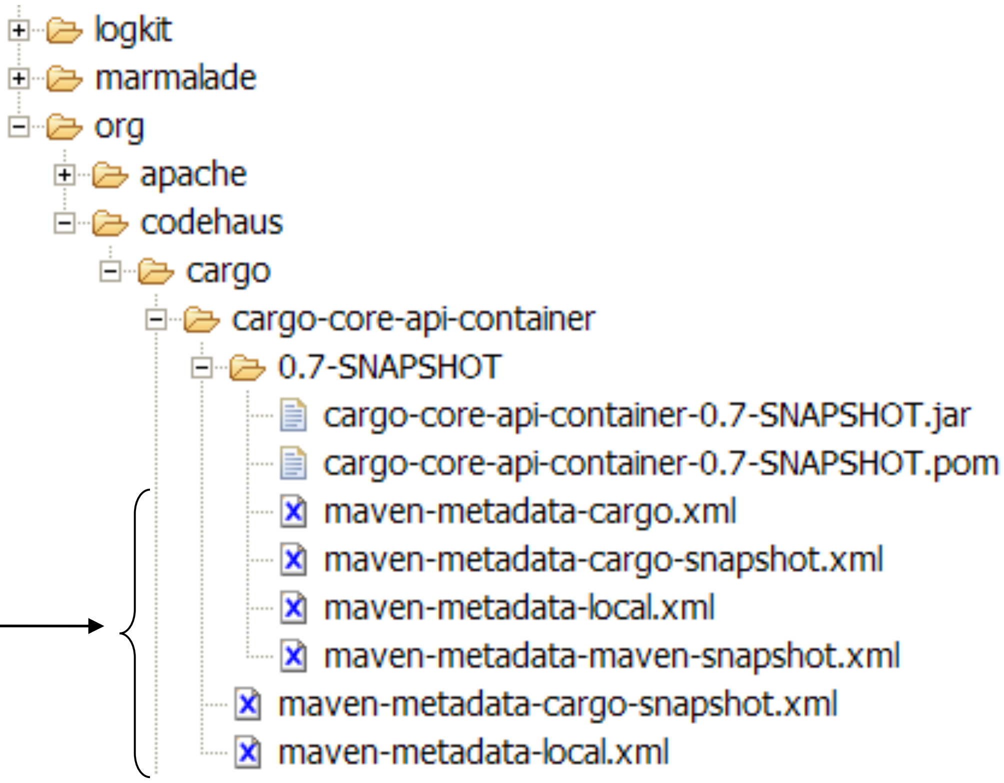
Artifact repositories (2/3)

- Some public remote repositories



Artifact repositories (3/3)

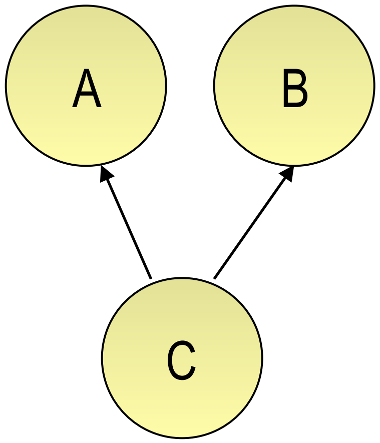
- Hierarchical structure
- Automatic plugin download
- Plugins are read directly from the repository
- Configurable strategies for checking the remote repositories for updates
  - Daily check by default for plugin and ranges updates
- Remote repositories contain Metadata information
  - Releases, latest, and more to come



```
+ logkit
+ marmalade
- org
  + apache
  - codehaus
    - cargo
      - cargo-core-api-container
        - 0.7-SNAPSHOT
            cargo-core-api-container-0.7-SNAPSHOT.jar
            cargo-core-api-container-0.7-SNAPSHOT.pom
            maven-metadata-cargo.xml
            maven-metadata-cargo-snapshot.xml
            maven-metadata-local.xml
            maven-metadata-maven-snapshot.xml
          maven-metadata-cargo-snapshot.xml
          maven-metadata-local.xml
```

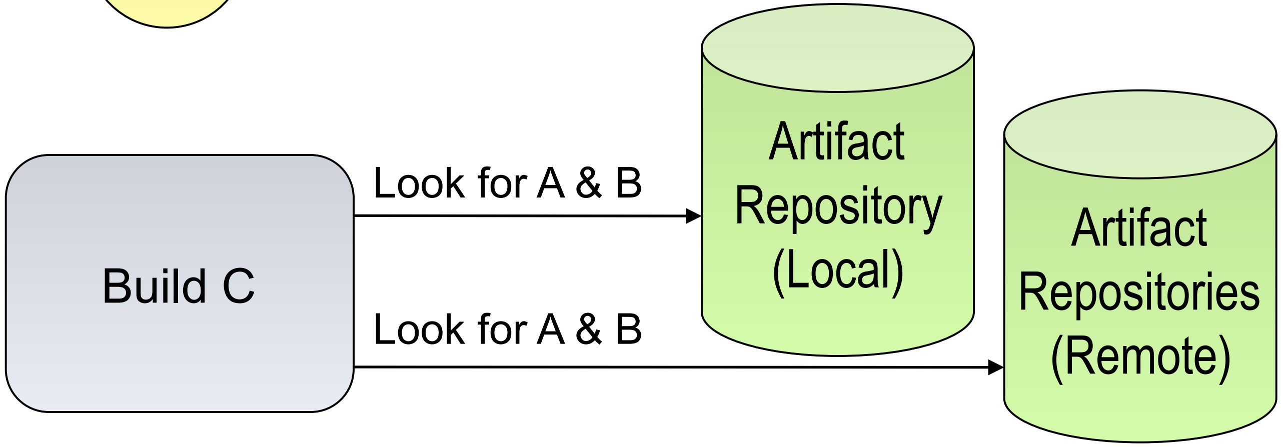
Dependency management (1/2)

- Maven uses binary dependencies



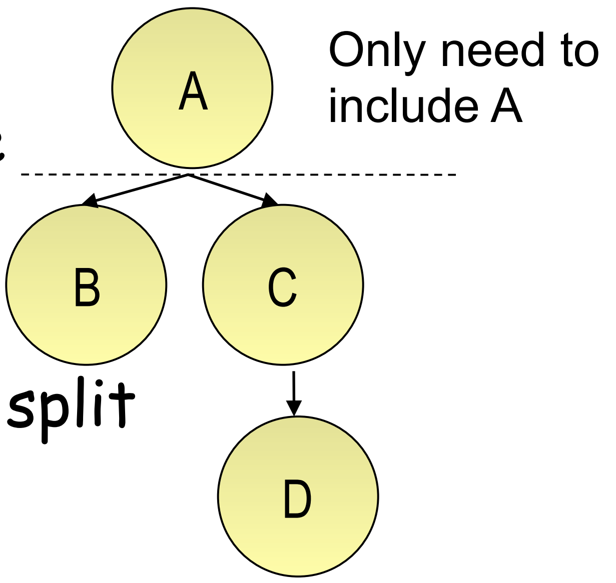
« any version after 1.0 »

```
<dependencies>
  <dependency>
    <groupId>com.acme</groupId>
    <artifactId>B</artifactId>
    <version>[1.0,)</version>
    <scope>compile</scope>
  </dependency>
</dependencies>
```



Dependency management (2/2)

- Transitive dependencies
  - Possibility to exclude some depndencies
  - Need good metadata
  - Ideally projects should be split
- SNAPSHOT handling
  - Always get latest
- Automatic dependency updates
  - By default every day



Installation and Setup

- `http://maven.apache.org/`
- Add Maven's bin directory to PATH
- Ensure JAVA_HOME is set to SDK
- Run `mvn –version` to test install

```
C:\Documents and Settings\alina>mvn -version
Maven version: 3.0.4
Java version: 1.6.0_30
```

Maven plugin for JAVA IDE

- Maven plugins exists for
  - Eclipse
  - Intellij
  - NetBeans
  - …

Installing JARs to local repository

- Sometimes you need to put some specific JARs in your local repository for use in your builds
- The JARs must be placed in the correct place in order for it to be correctly picked up by Maven
- To install a JAR in the local repository use the following command:

```
mvn install:install-file -Dfile=<path-to-file> -DgroupId=<group-id> \
-DartifactId=<artifact-id> -Dversion=<version> -Dpackaging=jar
```

- Now can include dependency in pom.xml:

```
<dependency>
    <groupId><group-id></groupId>
    <artifactId><artifact-id></artifactId>
    <version><version></version>
</dependency>
```

Overview of common Goals

- **clean** – clean the current project
- **validate** - validate the project is correct and all necessary information is available
- **compile** - compile the source code of the project
- **test** - test the compiled source code using a suitable unit testing framework. These tests should not require the code be packaged or deployed
- **package** - take the compiled code and package it in its distributable format, such as a JAR
- **integration-test** - process and deploy the package if necessary into an environment where integration tests can be run
- **install** - install the package into the local repository, for use as a dependency in other projects locally
- **deploy** - done in an integration or release environment, copies the final package to the remote repository for sharing with other developers and projects

More stuff

- Automatically generate reports, diagrams, and so on through Maven / the project site
- Internationalization – create different language project websites
- Create projects within projects (more pom.xml files inside sub dirs\jars), with different build stats and so on
- Maven can make .war files, EJBs, etc.

Using Maven Plugins

- Whenever you want to customise the build for a Maven project, this is done by adding or reconfiguring plugins
- For example, configure the Java compiler to allow JDK 5.0 sources
- Plugins in Maven 3.0 look much like a dependency

```
...
<build>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-compiler-plugin</artifactId>
      <configuration>
        <source>1.5</source>
        <target>1.5</target>
      </configuration>
    </plugin>
  </plugins>
</build>
...
```

Maven Plugins

- **AlmostPlainText**
- **Maven Axis**
- **Maven Cobertura**
- **Maven DB2**
- **Dbunit**
- **Debian Package**
- **Maven DotUml**
- **Doxygen**
- **Maven Files**
- **FindBugs**
- **Maven flash**
- **Help**
- **Maven IzPack**
- **Java Application**
- **Maven JAVANCSS**
- **Maven JAXB**
- **JUNITPP**
- **Kodo**
- **Maven Macker**
- **SDocBook**
- **Sourceforge**
- **Maven SpringGraph**
- **RPM Plugin**
- **Runtime Builder**
- **Strutsdoc**
- **Tasks**
- **Maven Transform**
- **Maven UberDist**
- **Maven Vignette**
- **WebSphere 4.0**
- **WebSphere 5 (5.0/5.1)**
- **Maven WebLogic**
- **Canoo WebTest**
- **Wiki**
- **Word to HTML**
- **XML Resume**
- **Maven DotUml**
- **Middlegen**
- **Maven News**

Archetypes

- For reuse, create archetypes that work as project templates with build settings, etc
- An archetype is a project, with its own pom.xml
- An archetype has a descriptor called archetype.xml
- Allows easy generation of Maven projects

Good things about Maven

- Standardization
- Reuse
- Dependency management
- Build lifecycle management
- Large existing repository
- IDE aware
- One directory layout
- A single way to define dependencies
- Setting up a project is really fast
- Transitive dependencies
- Common build structure
- Use of remote repository
- Web site generation
- Build best practices enforcement
- Automated build of application
- Works well with distributed teams
- All artifacts are versioned and are stored in a repository
- Build process is standardized for all projects
- A lot of goals are available
- It provides quality project information with generated site
- Easy to learn and use
- Makes the build process much easier at the project level
- Promotes modular design of code

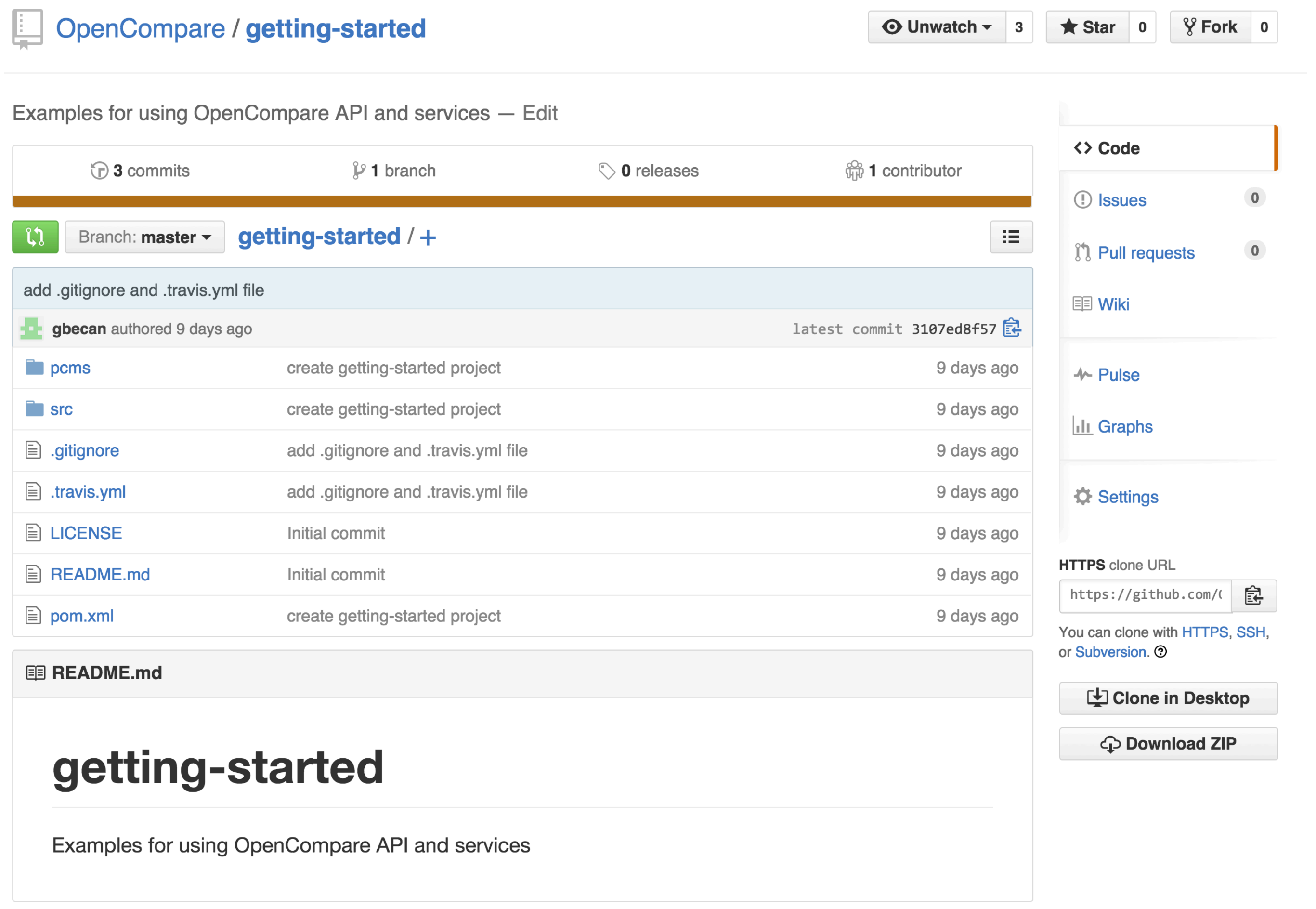
References

- Maven Home
  http://maven.apache.org/
- Maven Getting Started Guide
  http://maven.apache.org/guides/getting-started/index.html
- Steps for creating a Maven-based Website
  http://www.javaworld.com/javaworld/jw-02-2006/jw-0227-maven_p.html
/
- Maven Integration for Eclipse
  http://m2eclipse.codehaus.org/

Example and Demonstration

An example: getting started with OpenCompare

https://github.com/OpenCompare/getting-started



OpenCompare / getting-started

Unwatch 3 | Star 0 | Fork 0

Examples for using OpenCompare API and services — Edit

3 commits | 1 branch | 0 releases | 1 contributor

Branch: master | getting-started / +

add .gitignore and .travis.yml file

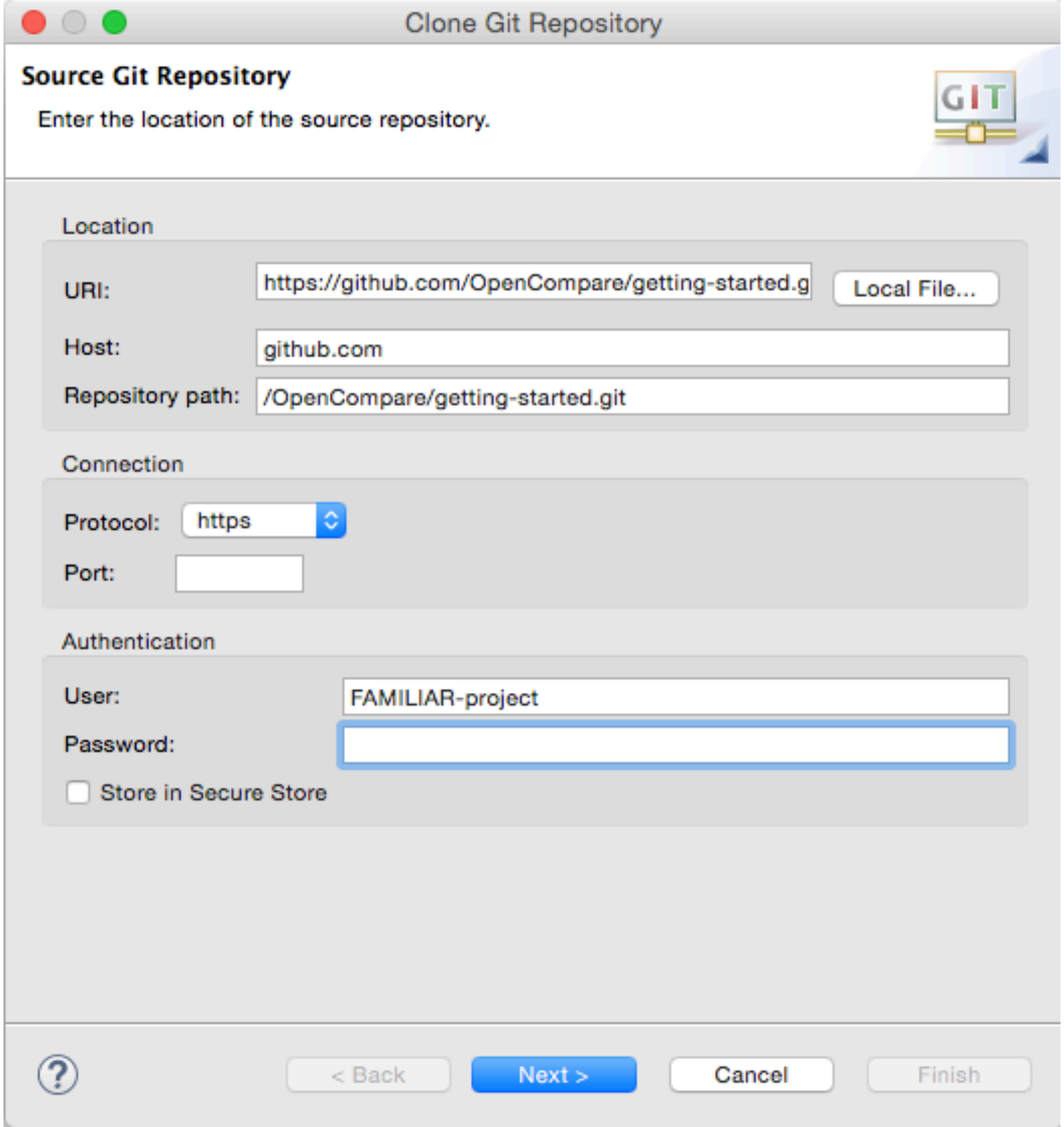
gbecan authored 9 days ago | latest commit 3107ed8f57

pcms	create getting-started project	9 days ago
src	create getting-started project	9 days ago
.gitignore	add .gitignore and .travis.yml file	9 days ago
.travis.yml	add .gitignore and .travis.yml file	9 days ago
LICENSE	Initial commit	9 days ago
README.md	Initial commit	9 days ago
pom.xml	create getting-started project	9 days ago

README.md

getting-started

Examples for using OpenCompare API and services


Clone Git Repository

Source Git Repository

Enter the location of the source repository.

Location

URI: https://github.com/OpenCompare/getting-started.g

Host: github.com

Repository path: /OpenCompare/getting-started.git

Connection

Protocol: https

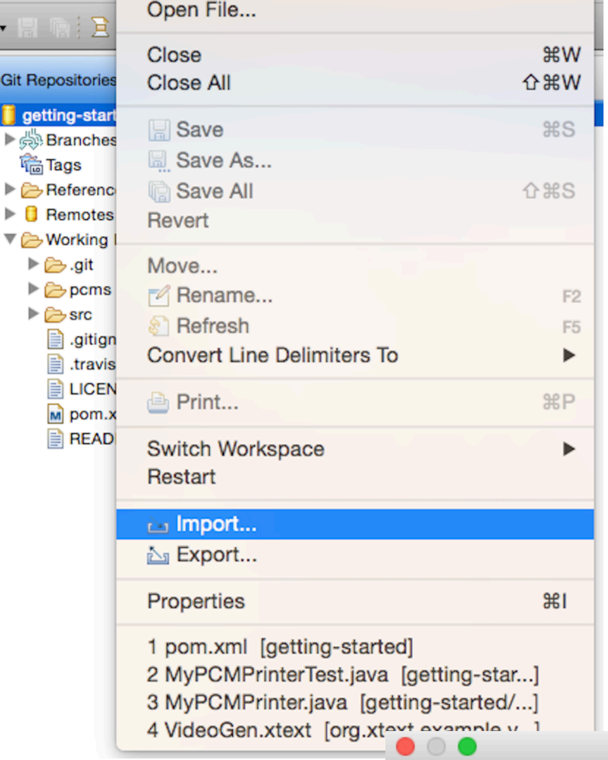
Port:

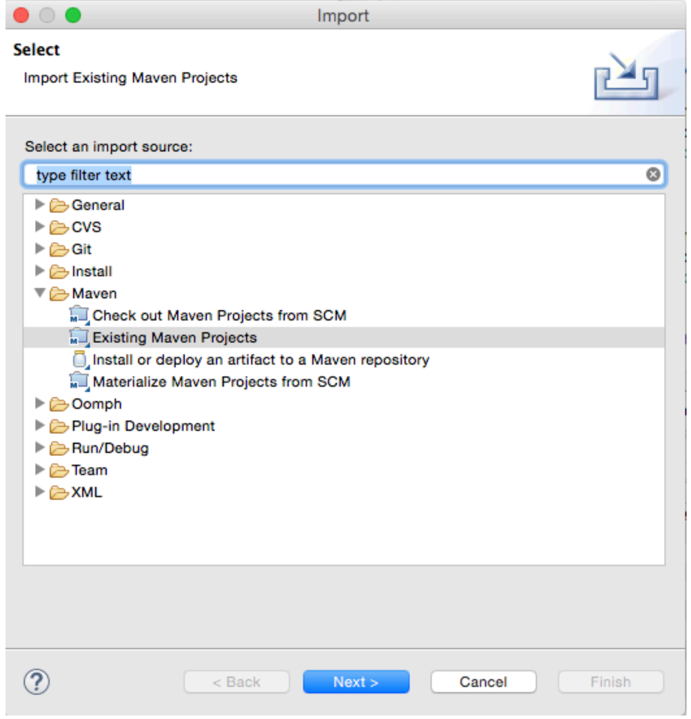
Authentication

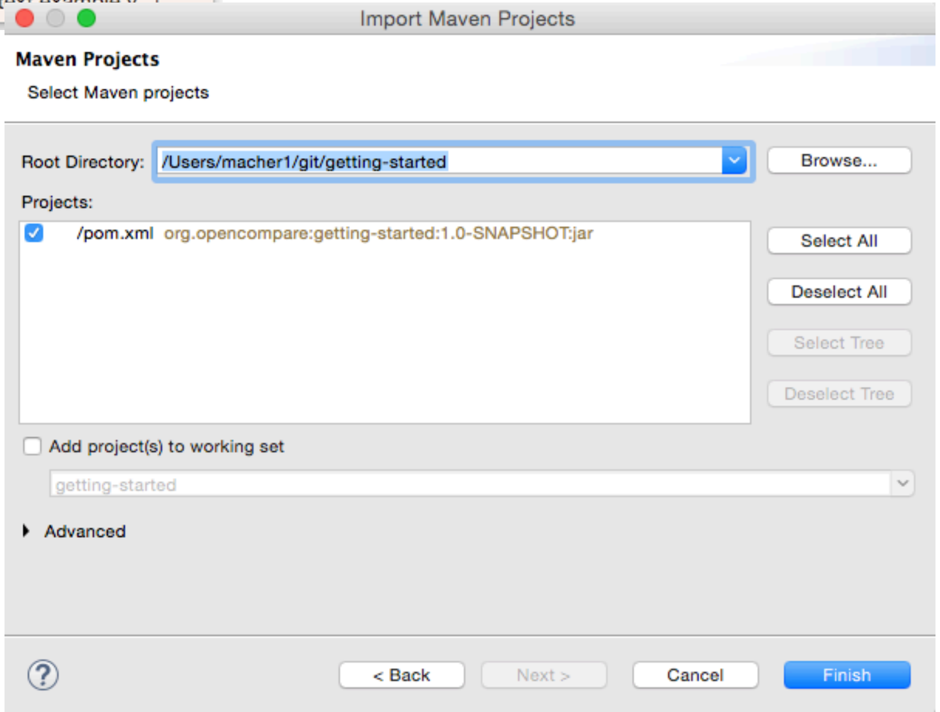
User: FAMILIAR-project

Password:

☐ Store in Secure Store







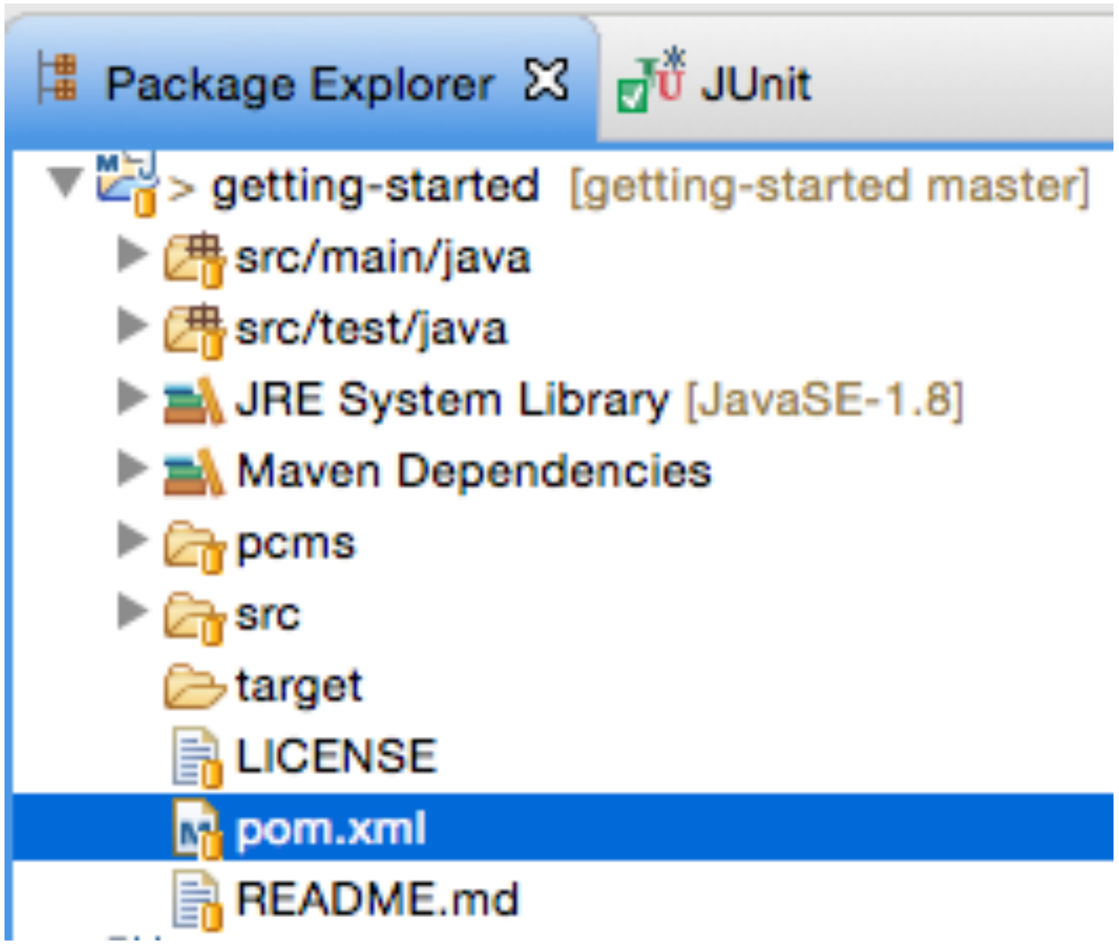
Root Directory: /Users/macher1/git/getting-started

Projects:

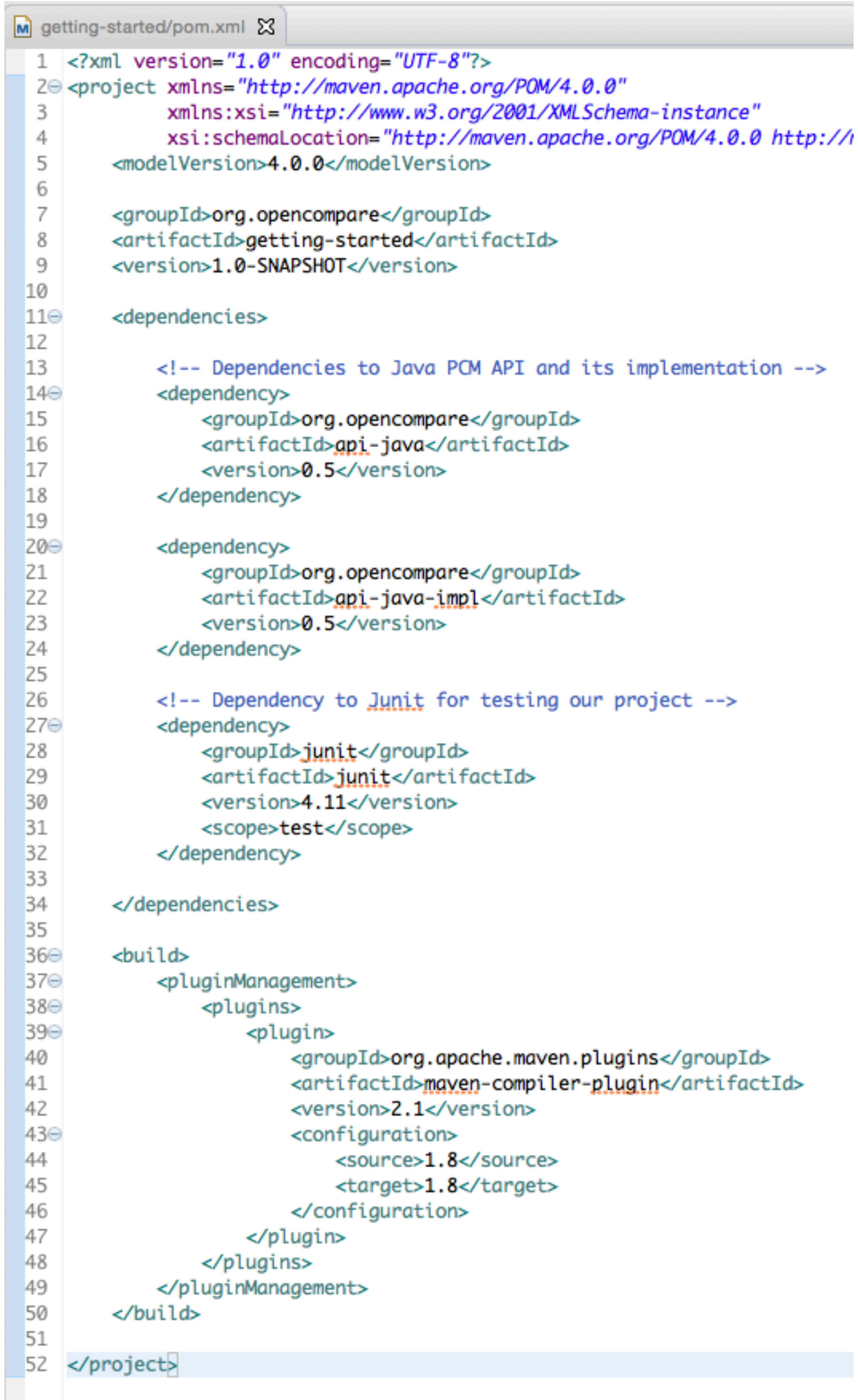
☑ /pom.xml org.opencompare:getting-started:1.0-SNAPSHOT:jar

☐ Add project(s) to working set

getting-started



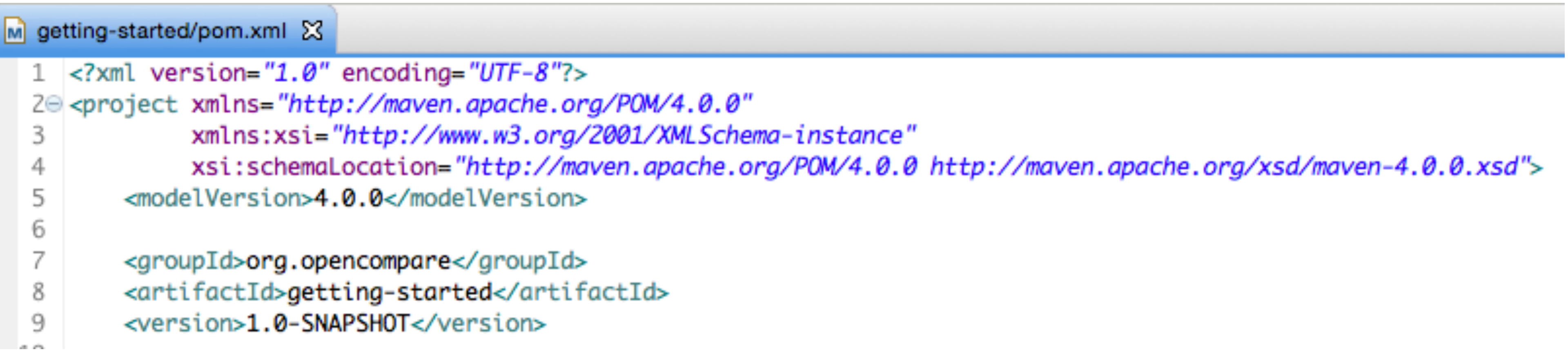
```
▼ > getting-started  [getting-started master]
  ▶ src/main/java
  ▶ src/test/java
  ▶ JRE System Library [JavaSE-1.8]
  ▶ Maven Dependencies
  ▶ pcms
  ▶ src
    target
    LICENSE
    pom.xml
    README.md
```



getting-started/pom.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.opencompare</groupId>
    <artifactId>getting-started</artifactId>
    <version>1.0-SNAPSHOT</version>

    <dependencies>

        <!-- Dependencies to Java PCM API and its implementation -->
        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java</artifactId>
            <version>0.5</version>
        </dependency>

        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java-impl</artifactId>
            <version>0.5</version>
        </dependency>

        <!-- Dependency to Junit for testing our project -->
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.11</version>
            <scope>test</scope>
        </dependency>

    </dependencies>

    <build>
        <pluginManagement>
            <plugins>
                <plugin>
                    <groupId>org.apache.maven.plugins</groupId>
                    <artifactId>maven-compiler-plugin</artifactId>
                    <version>2.1</version>
                    <configuration>
                        <source>1.8</source>
                        <target>1.8</target>
                    </configuration>
                </plugin>
            </plugins>
        </pluginManagement>
    </build>

</project>
```

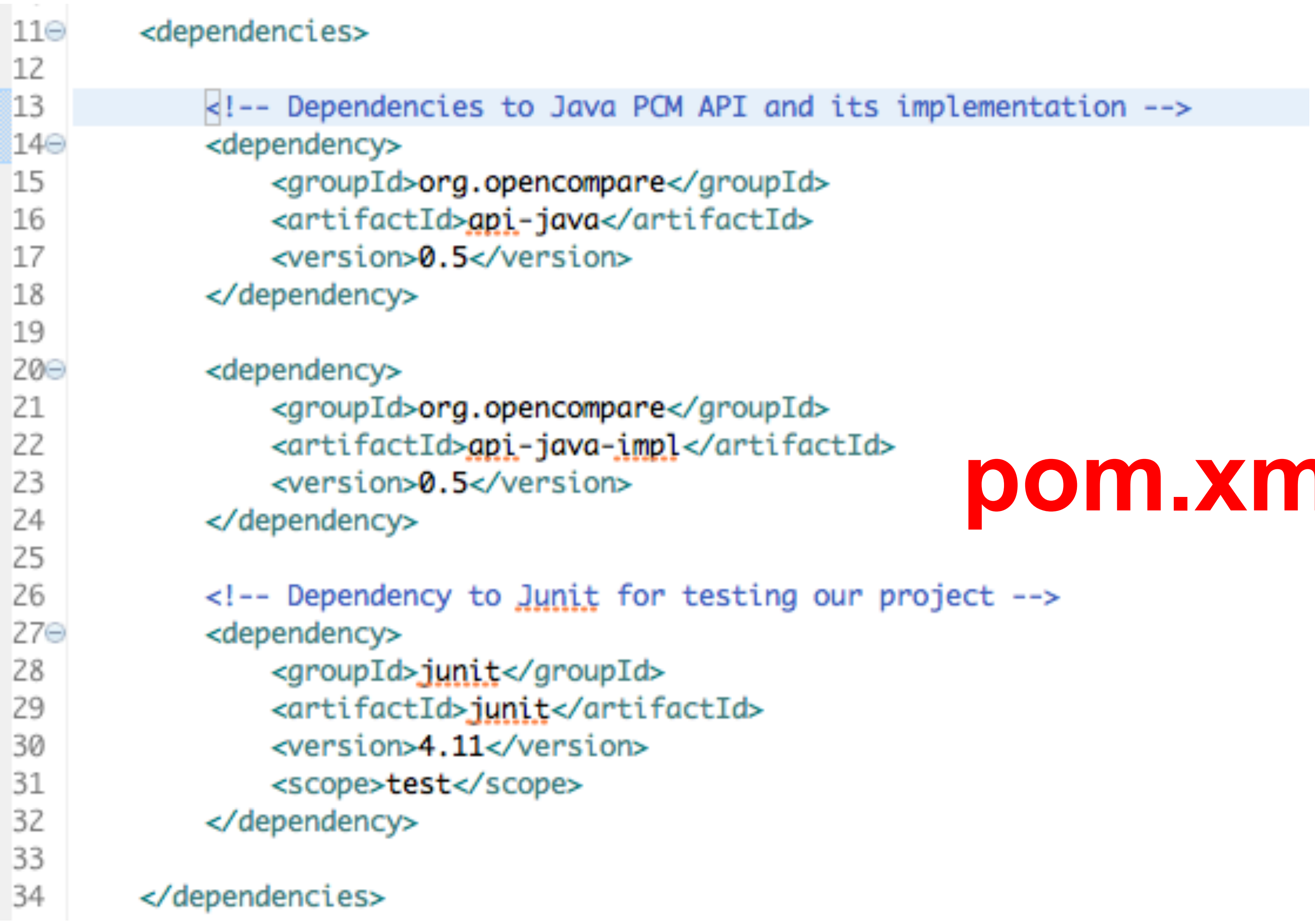
pom.xml



getting-started/pom.xml

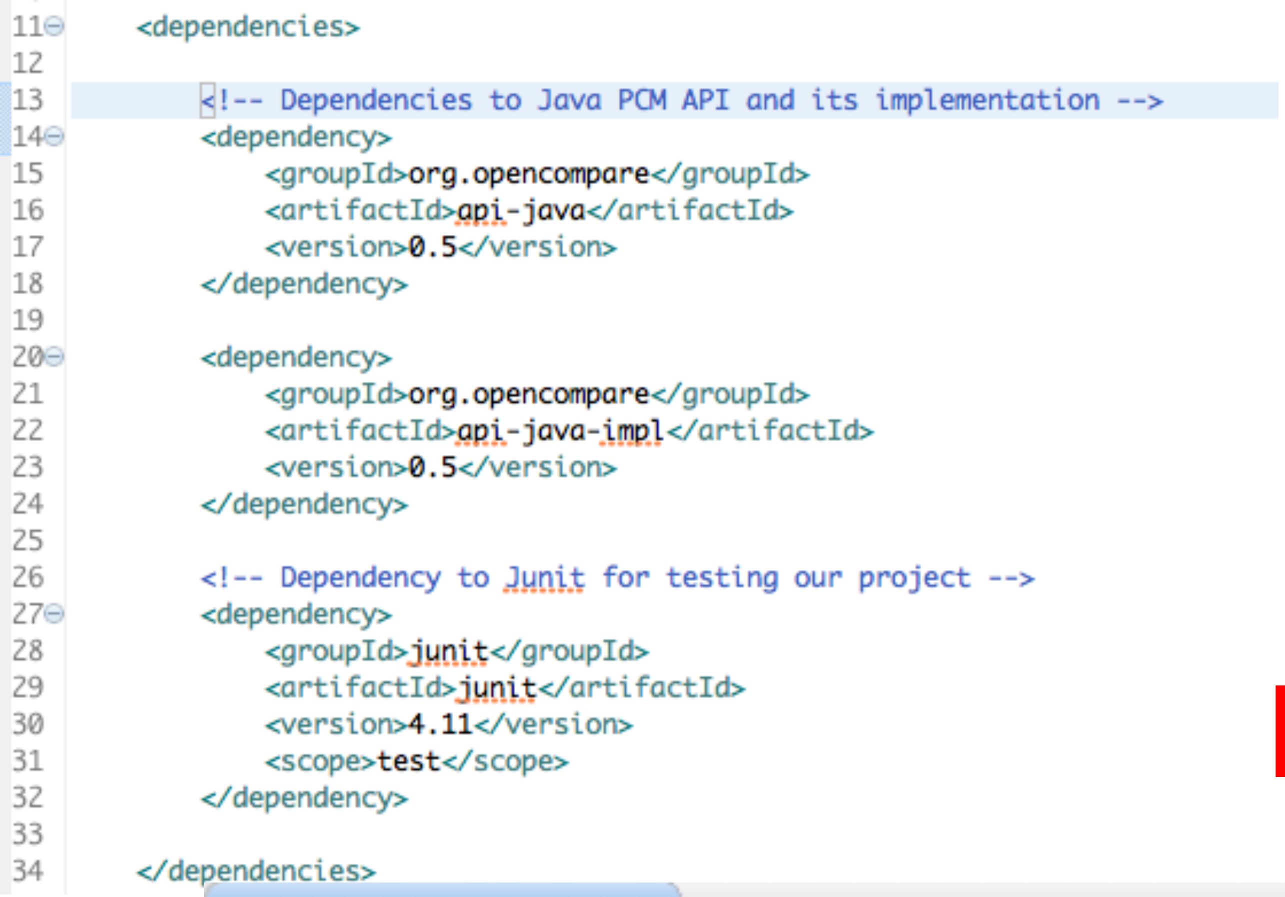
```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.opencompare</groupId>
    <artifactId>getting-started</artifactId>
    <version>1.0-SNAPSHOT</version>
```

pom.xml



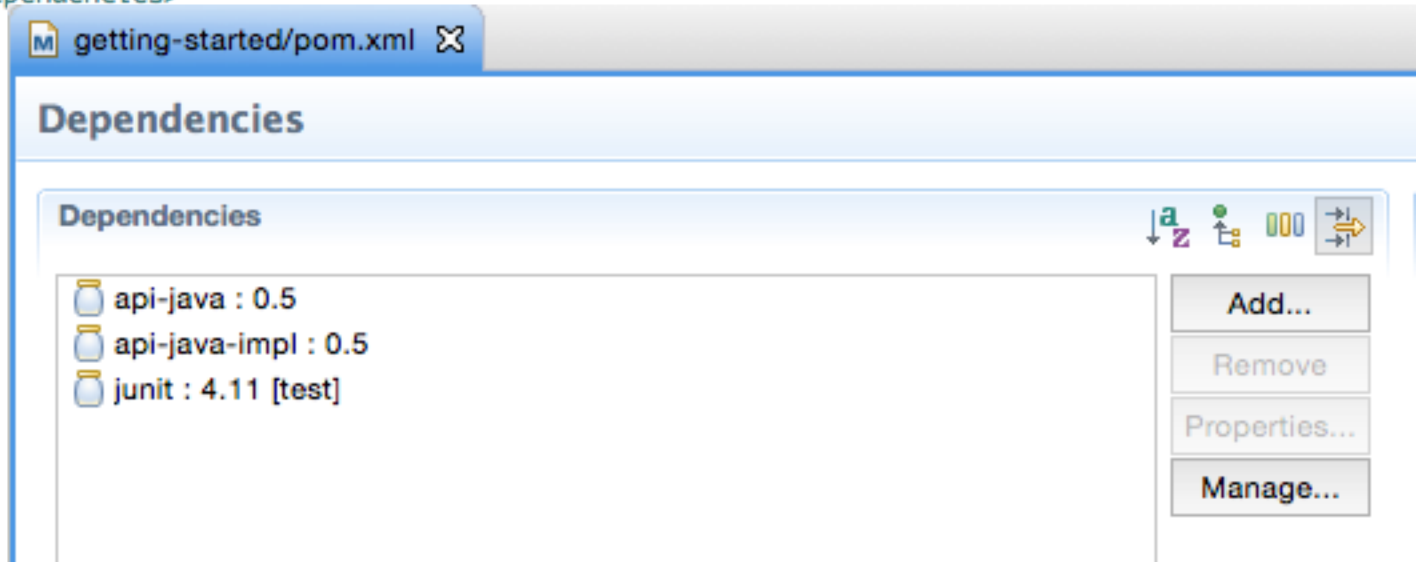
```
    <dependencies>

        <!-- Dependencies to Java PCM API and its implementation -->
        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java</artifactId>
            <version>0.5</version>
        </dependency>

        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java-impl</artifactId>
            <version>0.5</version>
        </dependency>

        <!-- Dependency to Junit for testing our project -->
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.11</version>
            <scope>test</scope>
        </dependency>

    </dependencies>
```

pom.xml



```xml
    <dependencies>

        <!-- Dependencies to Java PCM API and its implementation -->
        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java</artifactId>
            <version>0.5</version>
        </dependency>

        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java-impl</artifactId>
            <version>0.5</version>
        </dependency>

        <!-- Dependency to Junit for testing our project -->
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.11</version>
            <scope>test</scope>
        </dependency>

    </dependencies>
```

pom.xml

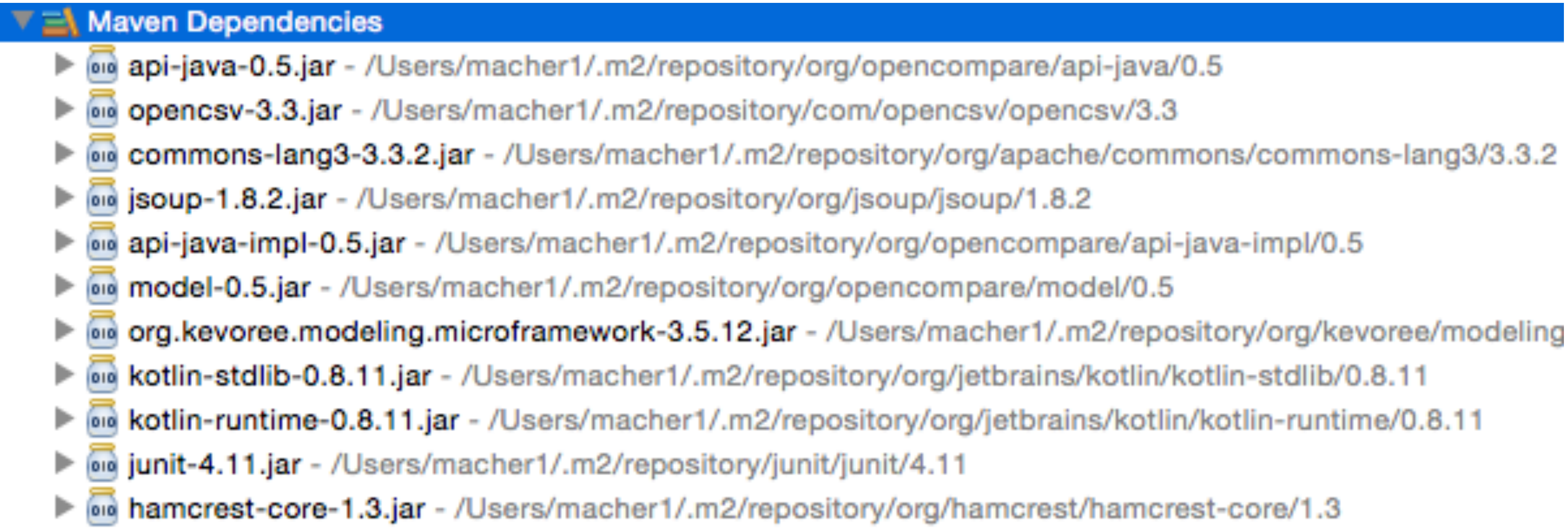


getting-started/pom.xml

Dependencies

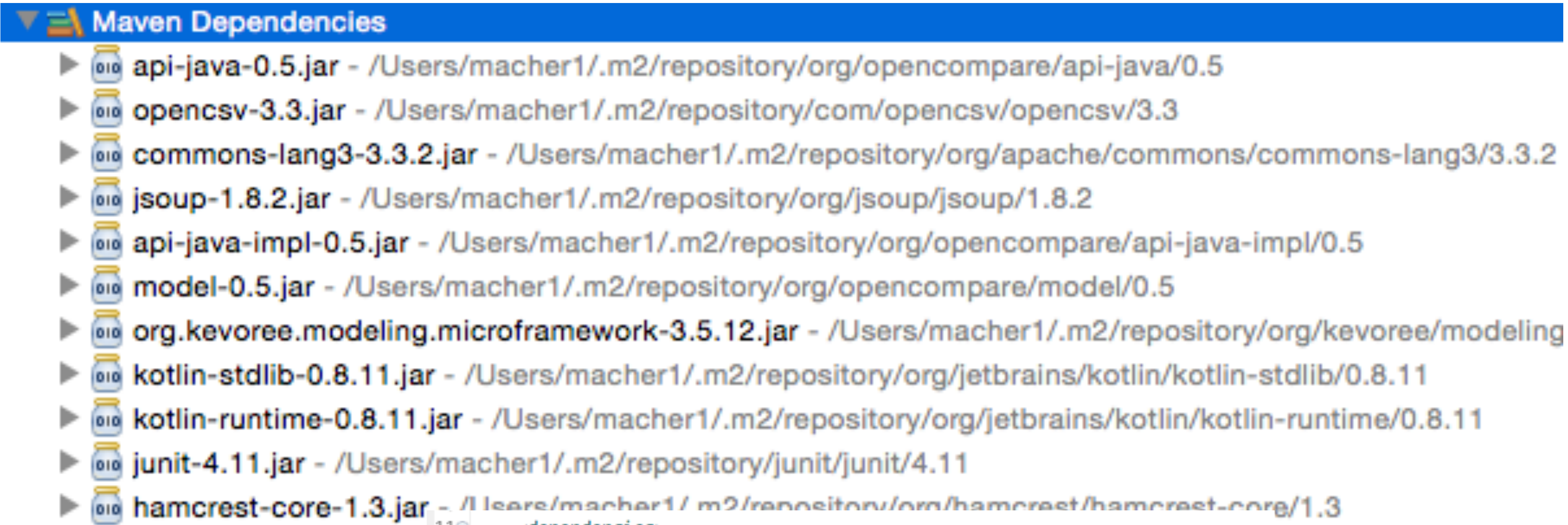
Dependencies

- api-java : 0.5
- api-java-impl : 0.5
- junit : 4.11 [test]

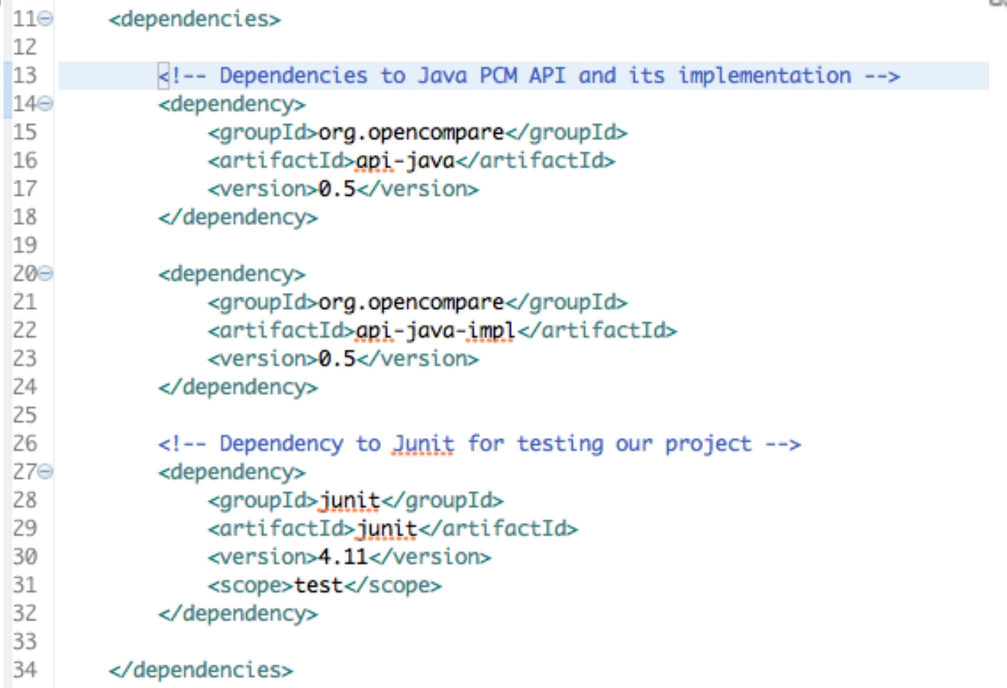


```
▼ Maven Dependencies
  ▶ api-java-0.5.jar - /Users/macher1/.m2/repository/org/opencompare/api-java/0.5
  ▶ opencsv-3.3.jar - /Users/macher1/.m2/repository/com/opencsv/opencsv/3.3
  ▶ commons-lang3-3.3.2.jar - /Users/macher1/.m2/repository/org/apache/commons/commons-lang3/3.3.2
  ▶ jsoup-1.8.2.jar - /Users/macher1/.m2/repository/org/jsoup/jsoup/1.8.2
  ▶ api-java-impl-0.5.jar - /Users/macher1/.m2/repository/org/opencompare/api-java-impl/0.5
  ▶ model-0.5.jar - /Users/macher1/.m2/repository/org/opencompare/model/0.5
  ▶ org.kevoree.modeling.microframework-3.5.12.jar - /Users/macher1/.m2/repository/org/kevoree/modeling
  ▶ kotlin-stdlib-0.8.11.jar - /Users/macher1/.m2/repository/org/jetbrains/kotlin/kotlin-stdlib/0.8.11
  ▶ kotlin-runtime-0.8.11.jar - /Users/macher1/.m2/repository/org/jetbrains/kotlin/kotlin-runtime/0.8.11
  ▶ junit-4.11.jar - /Users/macher1/.m2/repository/junit/junit/4.11
  ▶ hamcrest-core-1.3.jar - /Users/macher1/.m2/repository/org/hamcrest/hamcrest-core/1.3
```

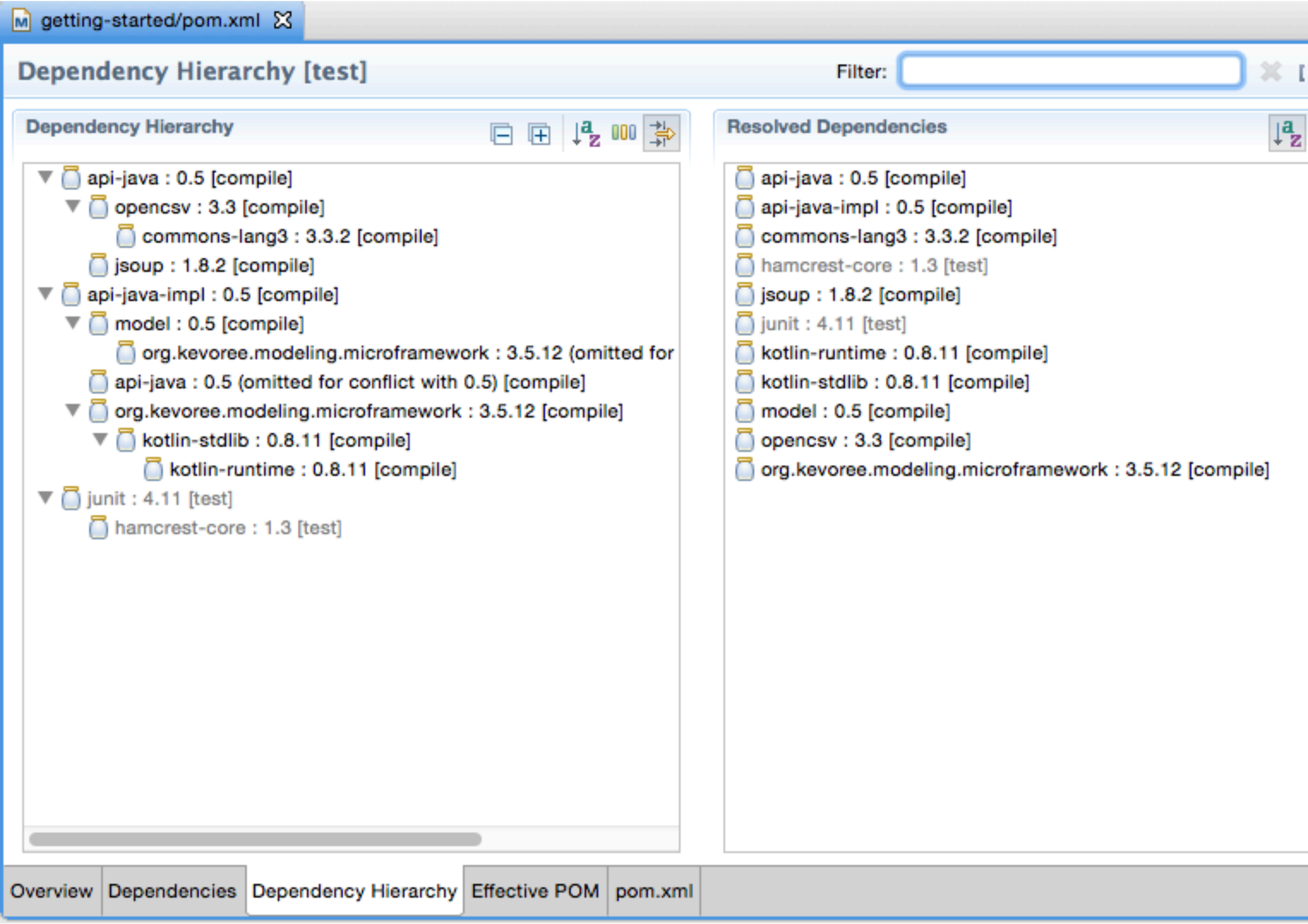
Why opencsv, jsoup, etc?



```
Maven Dependencies
  api-java-0.5.jar - /Users/macher1/.m2/repository/org/opencompare/api-java/0.5
  opencsv-3.3.jar - /Users/macher1/.m2/repository/com/opencsv/opencsv/3.3
  commons-lang3-3.3.2.jar - /Users/macher1/.m2/repository/org/apache/commons/commons-lang3/3.3.2
  jsoup-1.8.2.jar - /Users/macher1/.m2/repository/org/jsoup/jsoup/1.8.2
  api-java-impl-0.5.jar - /Users/macher1/.m2/repository/org/opencompare/api-java-impl/0.5
  model-0.5.jar - /Users/macher1/.m2/repository/org/opencompare/model/0.5
  org.kevoree.modeling.microframework-3.5.12.jar - /Users/macher1/.m2/repository/org/kevoree/modeling
  kotlin-stdlib-0.8.11.jar - /Users/macher1/.m2/repository/org/jetbrains/kotlin/kotlin-stdlib/0.8.11
  kotlin-runtime-0.8.11.jar - /Users/macher1/.m2/repository/org/jetbrains/kotlin/kotlin-runtime/0.8.11
  junit-4.11.jar - /Users/macher1/.m2/repository/junit/junit/4.11
  hamcrest-core-1.3.jar - /Users/macher1/.m2/repository/org/hamcrest/hamcrest-core/1.3
```

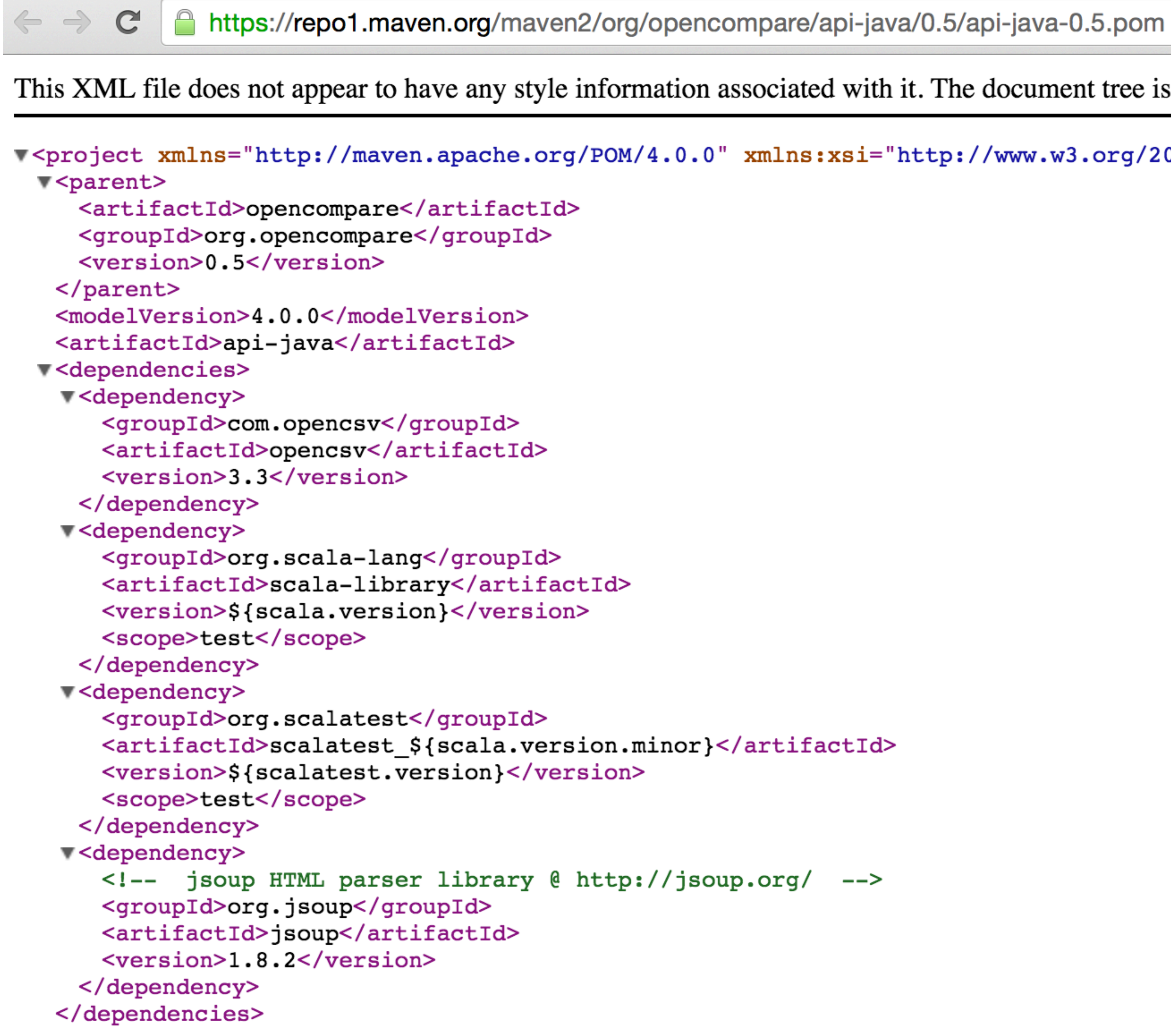


```xml
    <dependencies>

        <!-- Dependencies to Java PCM API and its implementation -->
        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java</artifactId>
            <version>0.5</version>
        </dependency>

        <dependency>
            <groupId>org.opencompare</groupId>
            <artifactId>api-java-impl</artifactId>
            <version>0.5</version>
        </dependency>

        <!-- Dependency to Junit for testing our project -->
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.11</version>
            <scope>test</scope>
        </dependency>

    </dependencies>
```



```
api-java : 0.5 [compile]
  opencsv : 3.3 [compile]
    commons-lang3 : 3.3.2 [compile]
  jsoup : 1.8.2 [compile]
api-java-impl : 0.5 [compile]
  model : 0.5 [compile]
    org.kevoree.modeling.microframework : 3.5.12 (omitted for
  api-java : 0.5 (omitted for conflict with 0.5) [compile]
  org.kevoree.modeling.microframework : 3.5.12 [compile]
    kotlin-stdlib : 0.8.11 [compile]
      kotlin-runtime : 0.8.11 [compile]
junit : 4.11 [test]
  hamcrest-core : 1.3 [test]
```

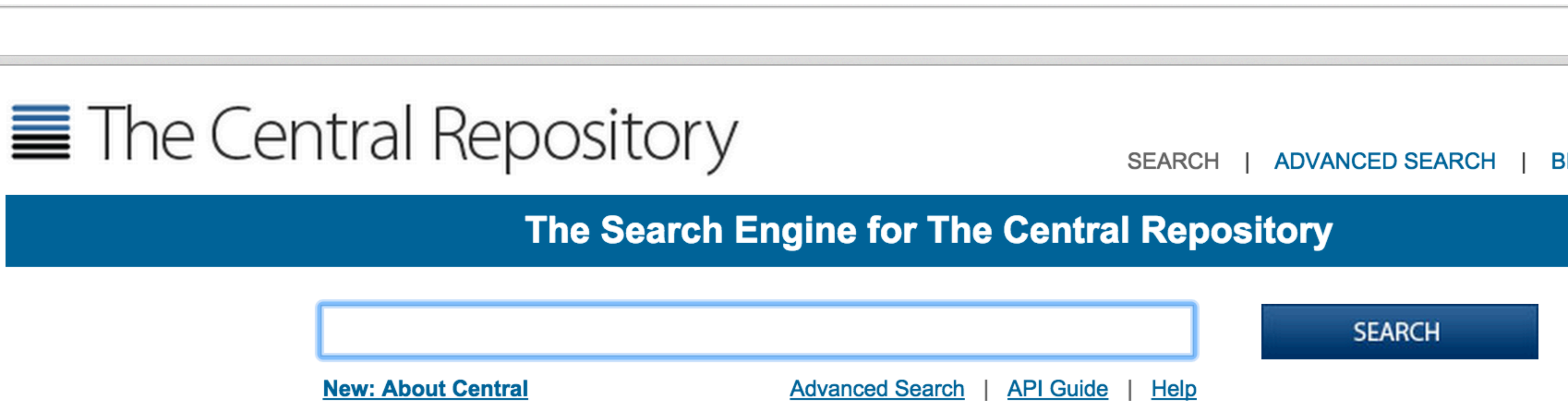
```
api-java : 0.5 [compile]
api-java-impl : 0.5 [compile]
commons-lang3 : 3.3.2 [compile]
hamcrest-core : 1.3 [test]
jsoup : 1.8.2 [compile]
junit : 4.11 [test]
kotlin-runtime : 0.8.11 [compile]
kotlin-stdlib : 0.8.11 [compile]
model : 0.5 [compile]
opencsv : 3.3 [compile]
org.kevoree.modeling.microframework : 3.5.12 [compile]
```

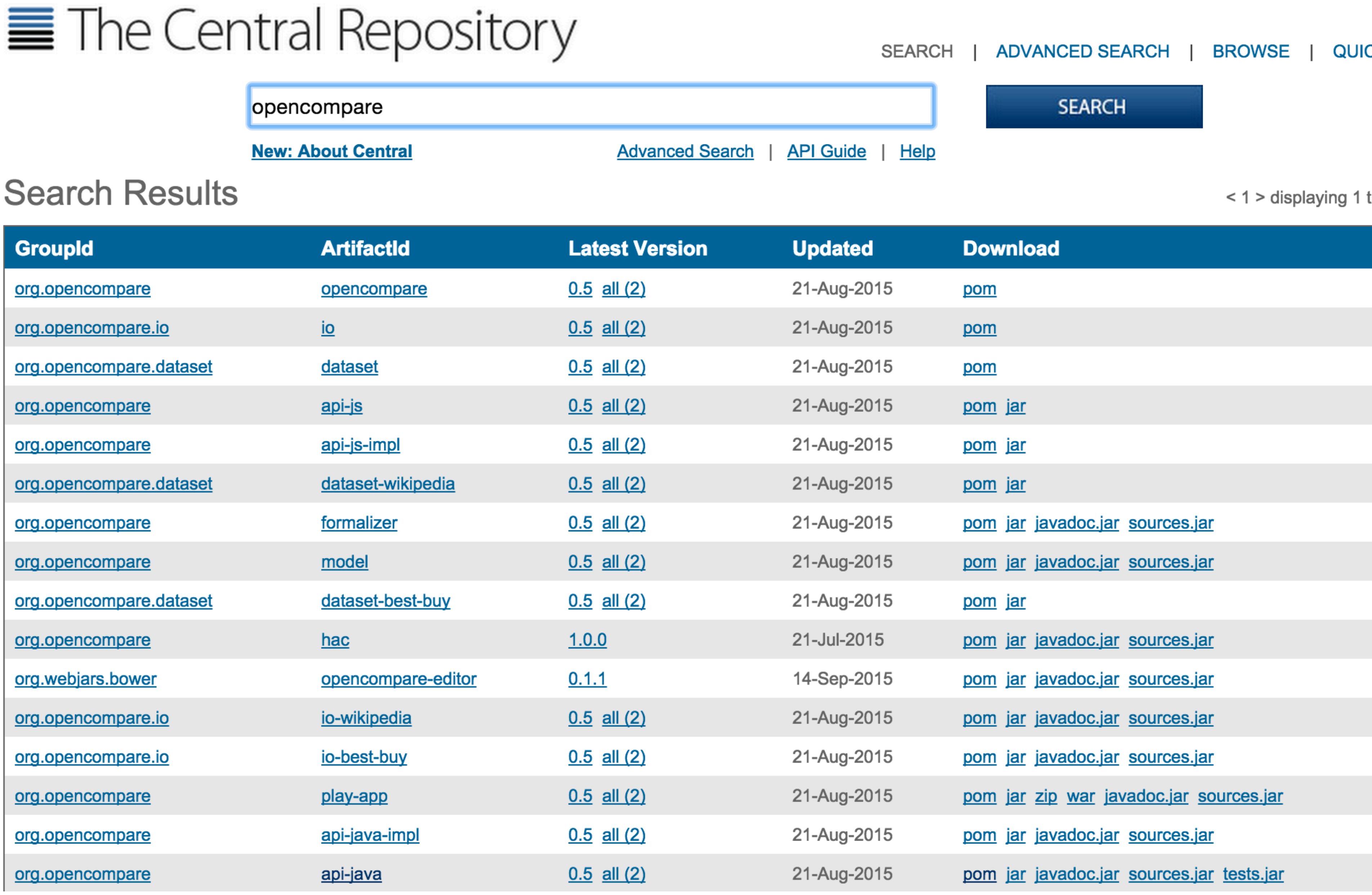

https://repo1.maven.org/maven2/org/opencompare/api-java/0.5/api-java-0.5.pom

This XML file does not appear to have any style information associated with it. The document tree is

```
▼<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2
  ▼<parent>
     <artifactId>opencompare</artifactId>
     <groupId>org.opencompare</groupId>
     <version>0.5</version>
   </parent>
   <modelVersion>4.0.0</modelVersion>
   <artifactId>api-java</artifactId>
  ▼<dependencies>
    ▼<dependency>
       <groupId>com.opencsv</groupId>
       <artifactId>opencsv</artifactId>
       <version>3.3</version>
     </dependency>
    ▼<dependency>
       <groupId>org.scala-lang</groupId>
       <artifactId>scala-library</artifactId>
       <version>${scala.version}</version>
       <scope>test</scope>
     </dependency>
    ▼<dependency>
       <groupId>org.scalatest</groupId>
       <artifactId>scalatest_${scala.version.minor}</artifactId>
       <version>${scalatest.version}</version>
       <scope>test</scope>
     </dependency>
    ▼<dependency>
       <!--  jsoup HTML parser library @ http://jsoup.org/  -->
       <groupId>org.jsoup</groupId>
       <artifactId>jsoup</artifactId>
       <version>1.8.2</version>
     </dependency>
   </dependencies>
```

http://search.maven.org/


The Central Repository
SEARCH | ADVANCED SEARCH | B
The Search Engine for The Central Repository
SEARCH
New: About Central
Advanced Search | API Guide | Help



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opencompare

SEARCH

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Search Results

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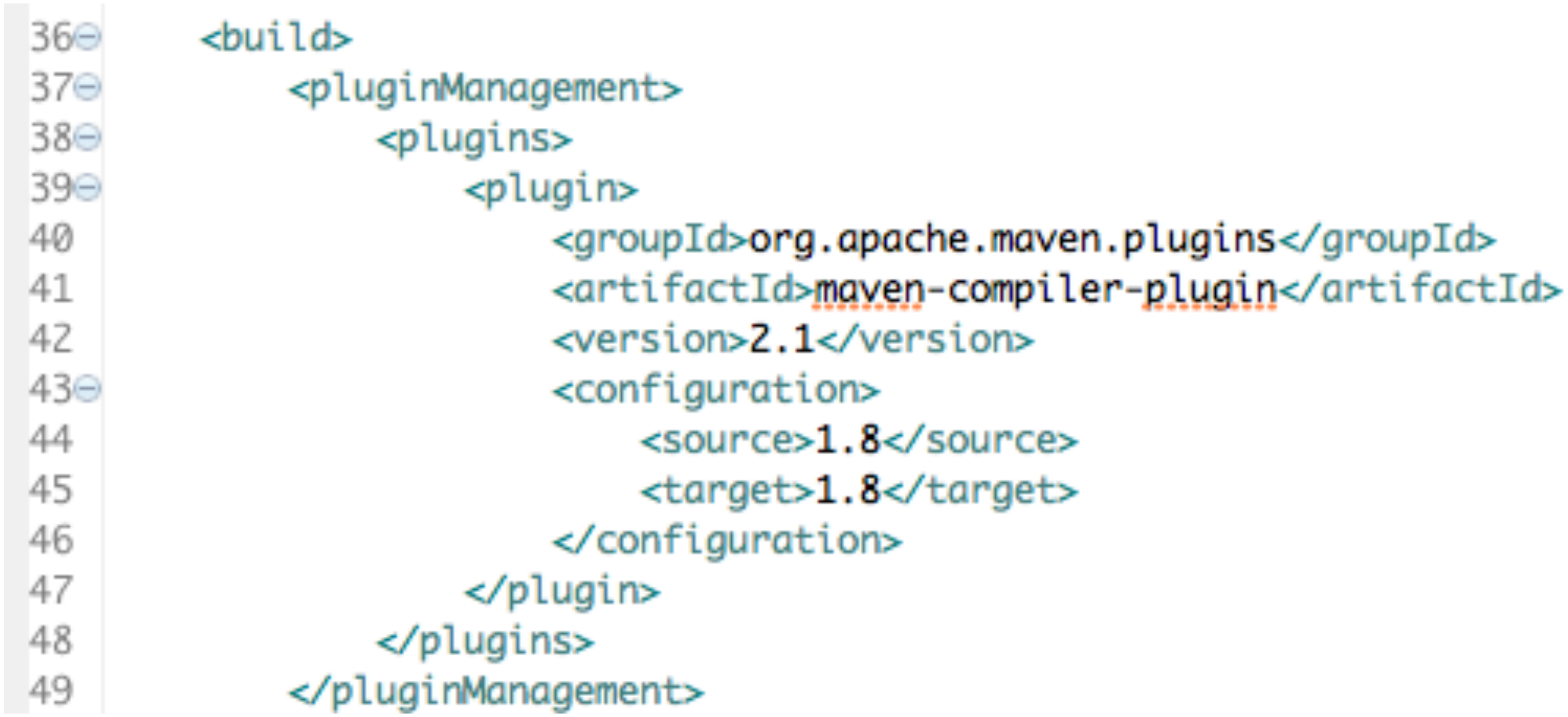
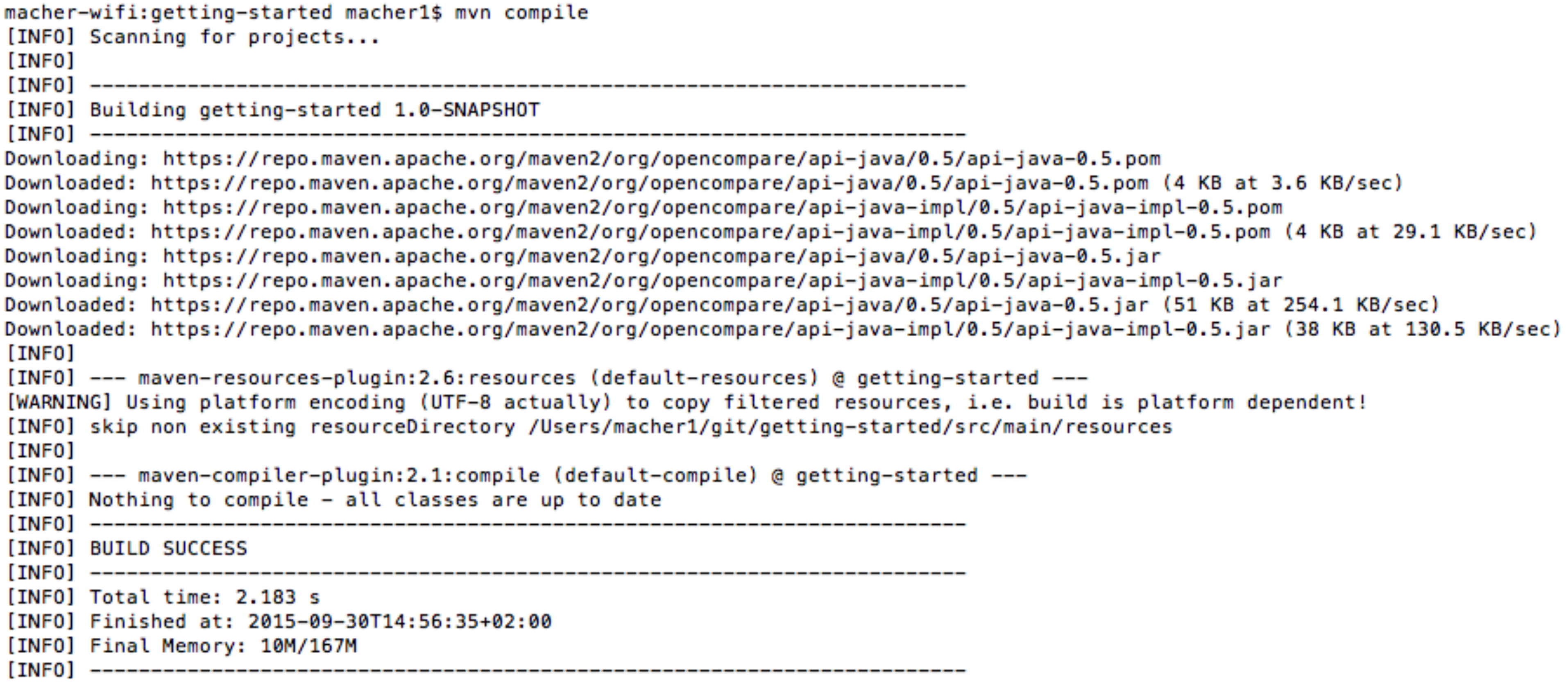
GroupId	ArtifactId	Latest Version	Updated	Download
org.opencompare	opencompare	0.5 all (2)	21-Aug-2015	pom
org.opencompare.io	io	0.5 all (2)	21-Aug-2015	pom
org.opencompare.dataset	dataset	0.5 all (2)	21-Aug-2015	pom
org.opencompare	api-js	0.5 all (2)	21-Aug-2015	pom jar
org.opencompare	api-js-impl	0.5 all (2)	21-Aug-2015	pom jar
org.opencompare.dataset	dataset-wikipedia	0.5 all (2)	21-Aug-2015	pom jar
org.opencompare	formalizer	0.5 all (2)	21-Aug-2015	pom jar javadoc.jar sources.jar
org.opencompare	model	0.5 all (2)	21-Aug-2015	pom jar javadoc.jar sources.jar
org.opencompare.dataset	dataset-best-buy	0.5 all (2)	21-Aug-2015	pom jar
org.opencompare	hac	1.0.0	21-Jul-2015	pom jar javadoc.jar sources.jar
org.webjars.bower	opencompare-editor	0.1.1	14-Sep-2015	pom jar javadoc.jar sources.jar
org.opencompare.io	io-wikipedia	0.5 all (2)	21-Aug-2015	pom jar javadoc.jar sources.jar
org.opencompare.io	io-best-buy	0.5 all (2)	21-Aug-2015	pom jar javadoc.jar sources.jar
org.opencompare	play-app	0.5 all (2)	21-Aug-2015	pom jar zip war javadoc.jar sources.jar
org.opencompare	api-java-impl	0.5 all (2)	21-Aug-2015	pom jar javadoc.jar sources.jar
org.opencompare	api-java	0.5 all (2)	21-Aug-2015	pom jar javadoc.jar sources.jar tests.jar

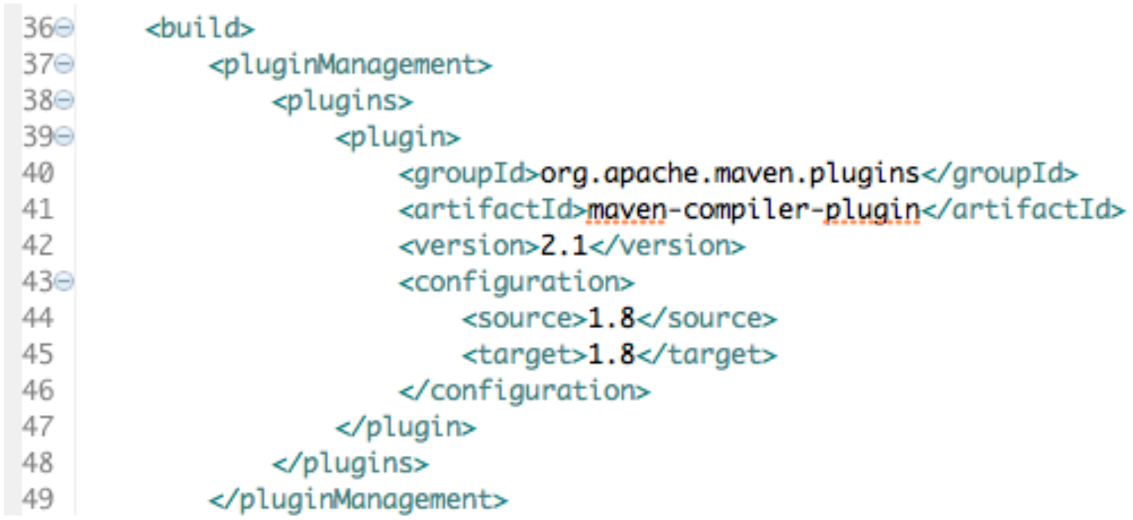
pom.xml



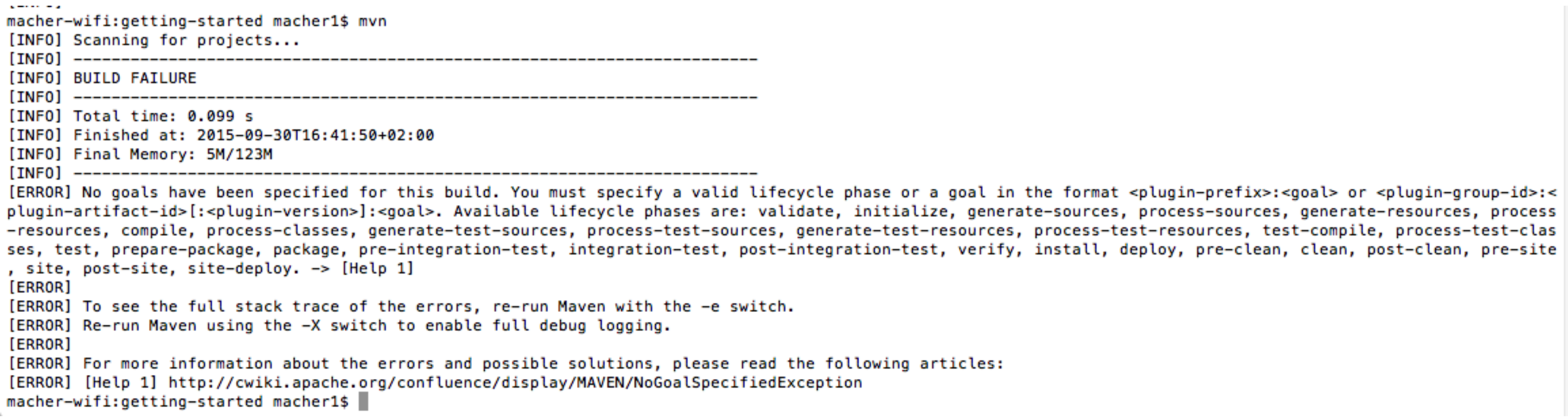
```xml
    <build>
        <pluginManagement>
            <plugins>
                <plugin>
                    <groupId>org.apache.maven.plugins</groupId>
                    <artifactId>maven-compiler-plugin</artifactId>
                    <version>2.1</version>
                    <configuration>
                        <source>1.8</source>
                        <target>1.8</target>
                    </configuration>
                </plugin>
            </plugins>
        </pluginManagement>
```



```
macher-wifi:getting-started macher1$ mvn compile
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building getting-started 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
Downloading: https://repo.maven.apache.org/maven2/org/opencompare/api-java/0.5/api-java-0.5.pom
Downloaded: https://repo.maven.apache.org/maven2/org/opencompare/api-java/0.5/api-java-0.5.pom (4 KB at 3.6 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/opencompare/api-java-impl/0.5/api-java-impl-0.5.pom
Downloaded: https://repo.maven.apache.org/maven2/org/opencompare/api-java-impl/0.5/api-java-impl-0.5.pom (4 KB at 29.1 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/opencompare/api-java/0.5/api-java-0.5.jar
Downloading: https://repo.maven.apache.org/maven2/org/opencompare/api-java-impl/0.5/api-java-impl-0.5.jar
Downloaded: https://repo.maven.apache.org/maven2/org/opencompare/api-java/0.5/api-java-0.5.jar (51 KB at 254.1 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/opencompare/api-java-impl/0.5/api-java-impl-0.5.jar (38 KB at 130.5 KB/sec)
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ getting-started ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /Users/macher1/git/getting-started/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:2.1:compile (default-compile) @ getting-started ---
[INFO] Nothing to compile - all classes are up to date
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 2.183 s
[INFO] Finished at: 2015-09-30T14:56:35+02:00
[INFO] Final Memory: 10M/167M
[INFO] ------------------------------------------------------------------------
```

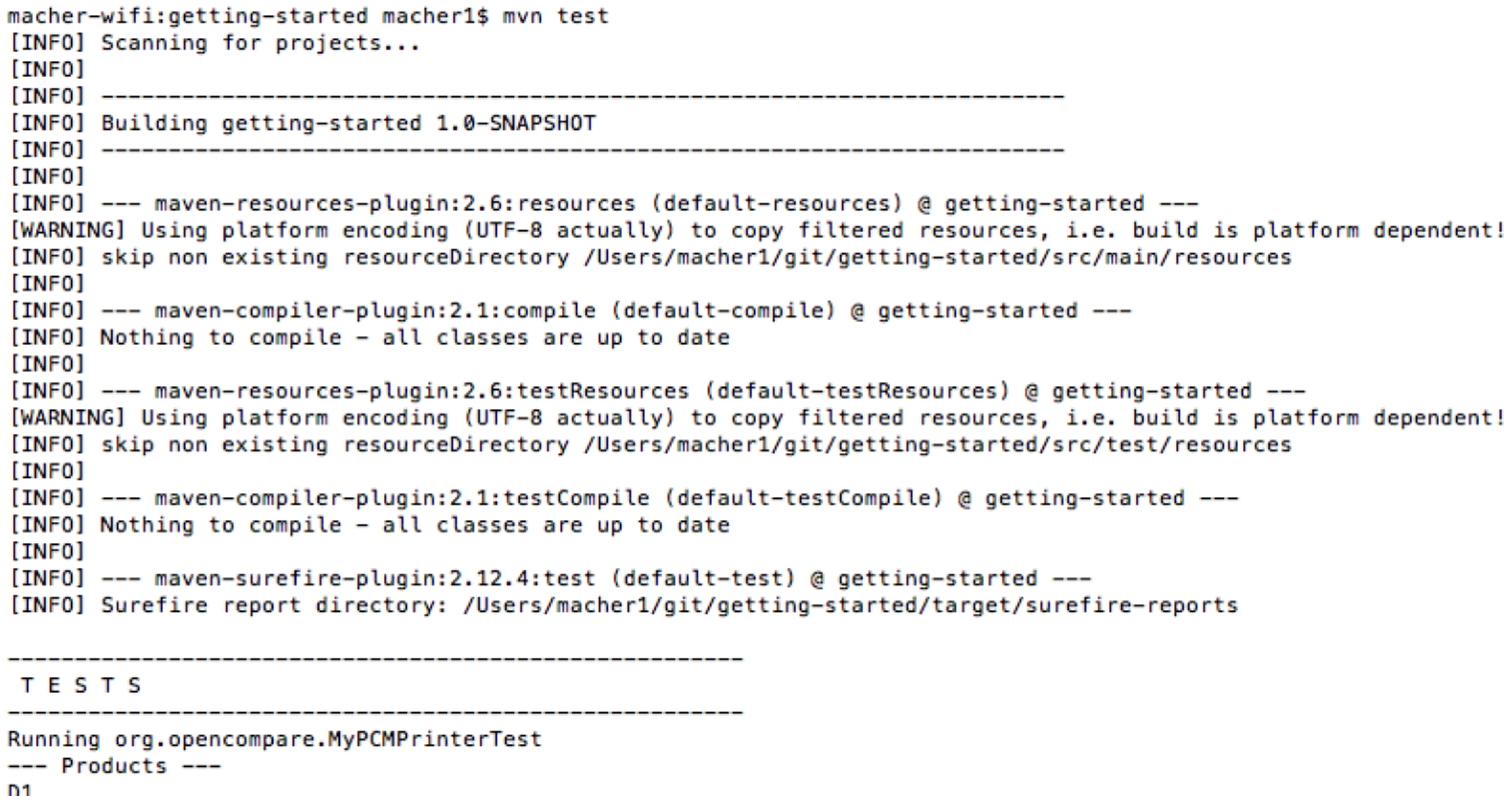


```
    <build>
        <pluginManagement>
            <plugins>
                <plugin>
                    <groupId>org.apache.maven.plugins</groupId>
                    <artifactId>maven-compiler-plugin</artifactId>
                    <version>2.1</version>
                    <configuration>
                        <source>1.8</source>
                        <target>1.8</target>
                    </configuration>
                </plugin>
            </plugins>
        </pluginManagement>
```

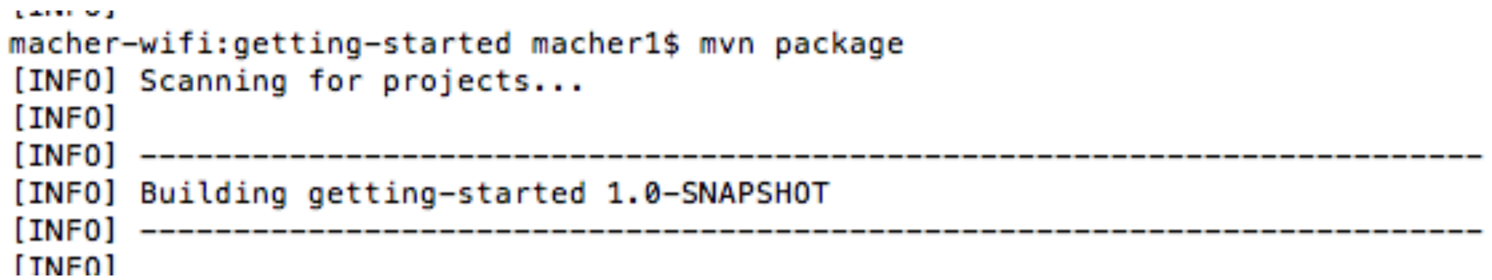


```
macher-wifi:getting-started macher1$ mvn
[INFO] Scanning for projects...
[INFO] ------------------------------------------------------------------------
[INFO] BUILD FAILURE
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 0.099 s
[INFO] Finished at: 2015-09-30T16:41:50+02:00
[INFO] Final Memory: 5M/123M
[INFO] ------------------------------------------------------------------------
[ERROR] No goals have been specified for this build. You must specify a valid lifecycle phase or a goal in the format <plugin-prefix>:<goal> or <plugin-group-id>:<
plugin-artifact-id>[:<plugin-version>]:<goal>. Available lifecycle phases are: validate, initialize, generate-sources, process-sources, generate-resources, process
-resources, compile, process-classes, generate-test-sources, process-test-sources, generate-test-resources, process-test-resources, test-compile, process-test-clas
ses, test, prepare-package, package, pre-integration-test, integration-test, post-integration-test, verify, install, deploy, pre-clean, clean, post-clean, pre-site
, site, post-site, site-deploy. -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/NoGoalSpecifiedException
macher-wifi:getting-started macher1$
```

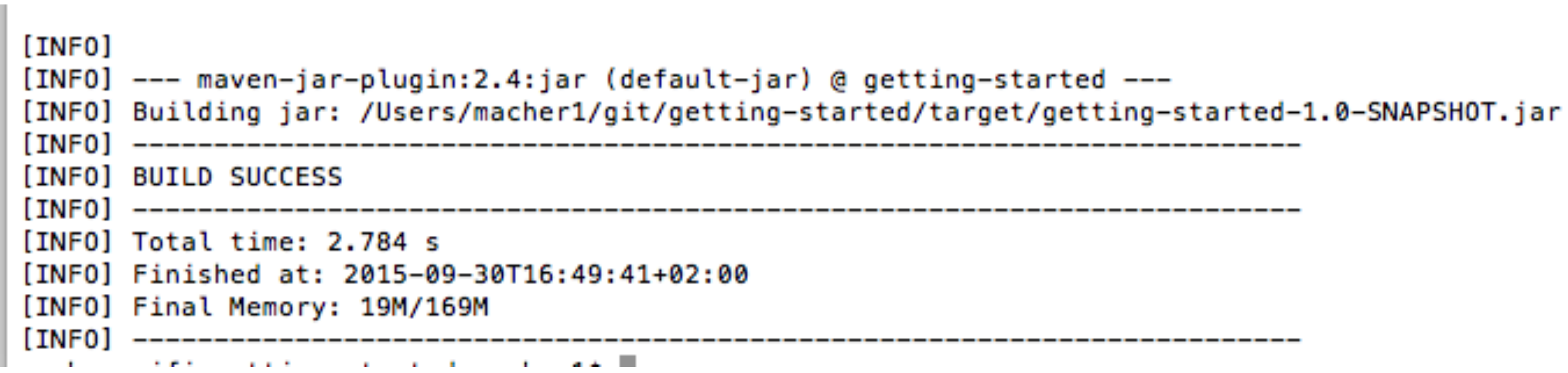
http://maven.apache.org/plugins/maven-compiler-plugin/usage.html



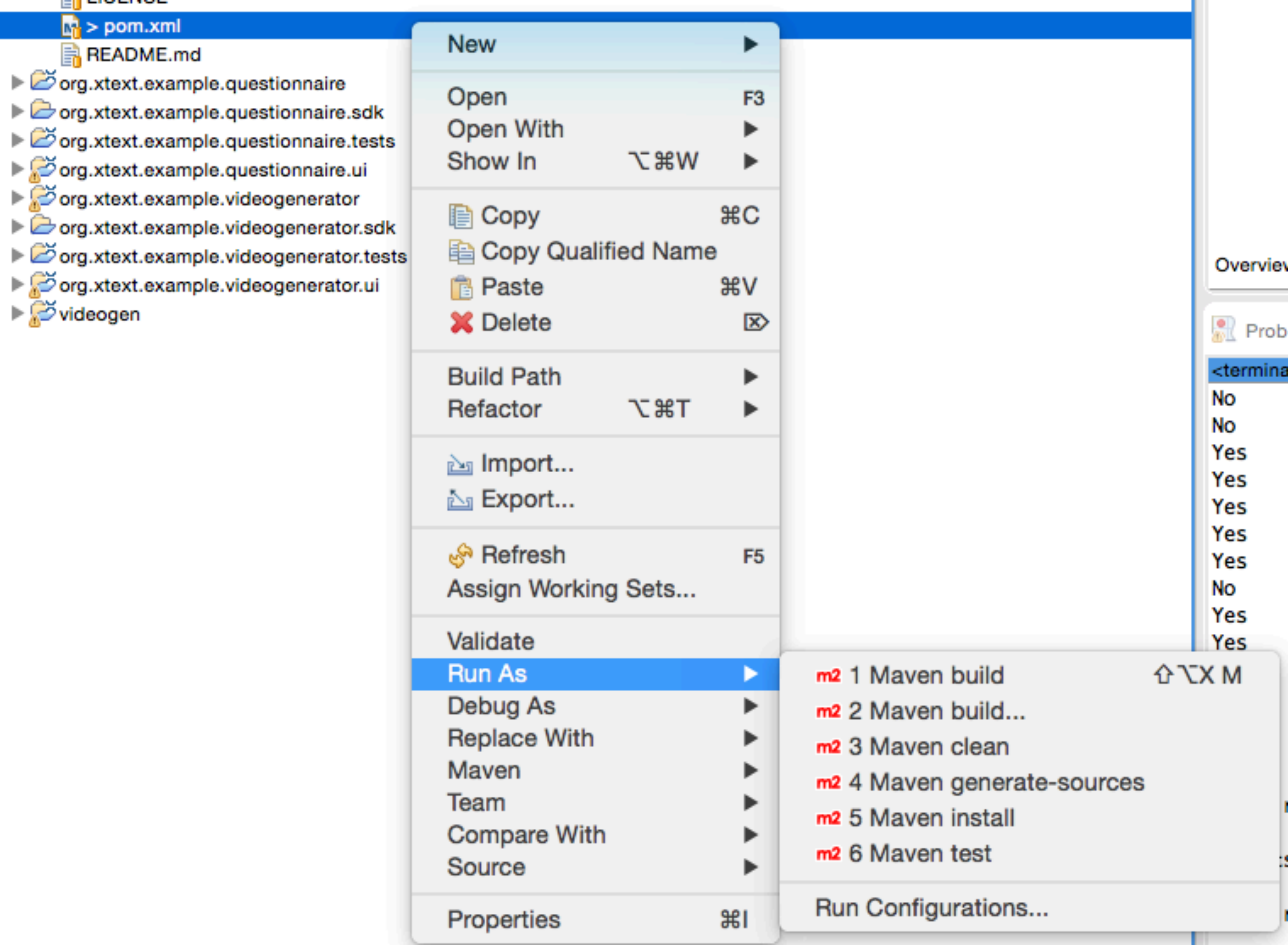
```
macher-wifi:getting-started macher1$ mvn test
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building getting-started 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ getting-started ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /Users/macher1/git/getting-started/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:2.1:compile (default-compile) @ getting-started ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ getting-started ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /Users/macher1/git/getting-started/src/test/resources
[INFO]
[INFO] --- maven-compiler-plugin:2.1:testCompile (default-testCompile) @ getting-started ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-surefire-plugin:2.12.4:test (default-test) @ getting-started ---
[INFO] Surefire report directory: /Users/macher1/git/getting-started/target/surefire-reports

-------------------------------------------------------
 T E S T S
-------------------------------------------------------
Running org.opencompare.MyPCMPrinterTest
--- Products ---
P1
```



```
macher-wifi:getting-started macher1$ mvn package
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building getting-started 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
```



```
[INFO]
[INFO] --- maven-jar-plugin:2.4:jar (default-jar) @ getting-started ---
[INFO] Building jar: /Users/macher1/git/getting-started/target/getting-started-1.0-SNAPSHOT.jar
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 2.784 s
[INFO] Finished at: 2015-09-30T16:49:41+02:00
[INFO] Final Memory: 19M/169M
[INFO] ------------------------------------------------------------------------
```


> pom.xml
README.md
org.xtext.example.questionnaire
org.xtext.example.questionnaire.sdk
org.xtext.example.questionnaire.tests
org.xtext.example.questionnaire.ui
org.xtext.example.videogenerator
org.xtext.example.videogenerator.sdk
org.xtext.example.videogenerator.tests
org.xtext.example.videogenerator.ui
videogen
New
Open F3
Open With
Show In ⌥⌘W
Copy ⌘C
Copy Qualified Name
Paste ⌘V
Delete
Build Path
Refactor ⌥⌘T
Import...
Export...
Refresh F5
Assign Working Sets...
Validate
Run As
Debug As
Replace With
Maven
Team
Compare With
Source
Properties ⌘I
m2 1 Maven build ⇧⌥X M
m2 2 Maven build...
m2 3 Maven clean
m2 4 Maven generate-sources
m2 5 Maven install
m2 6 Maven test
Run Configurations...
Overvie
Prob
<termina
No
No
Yes
Yes
Yes
Yes
Yes
No
Yes
Yes

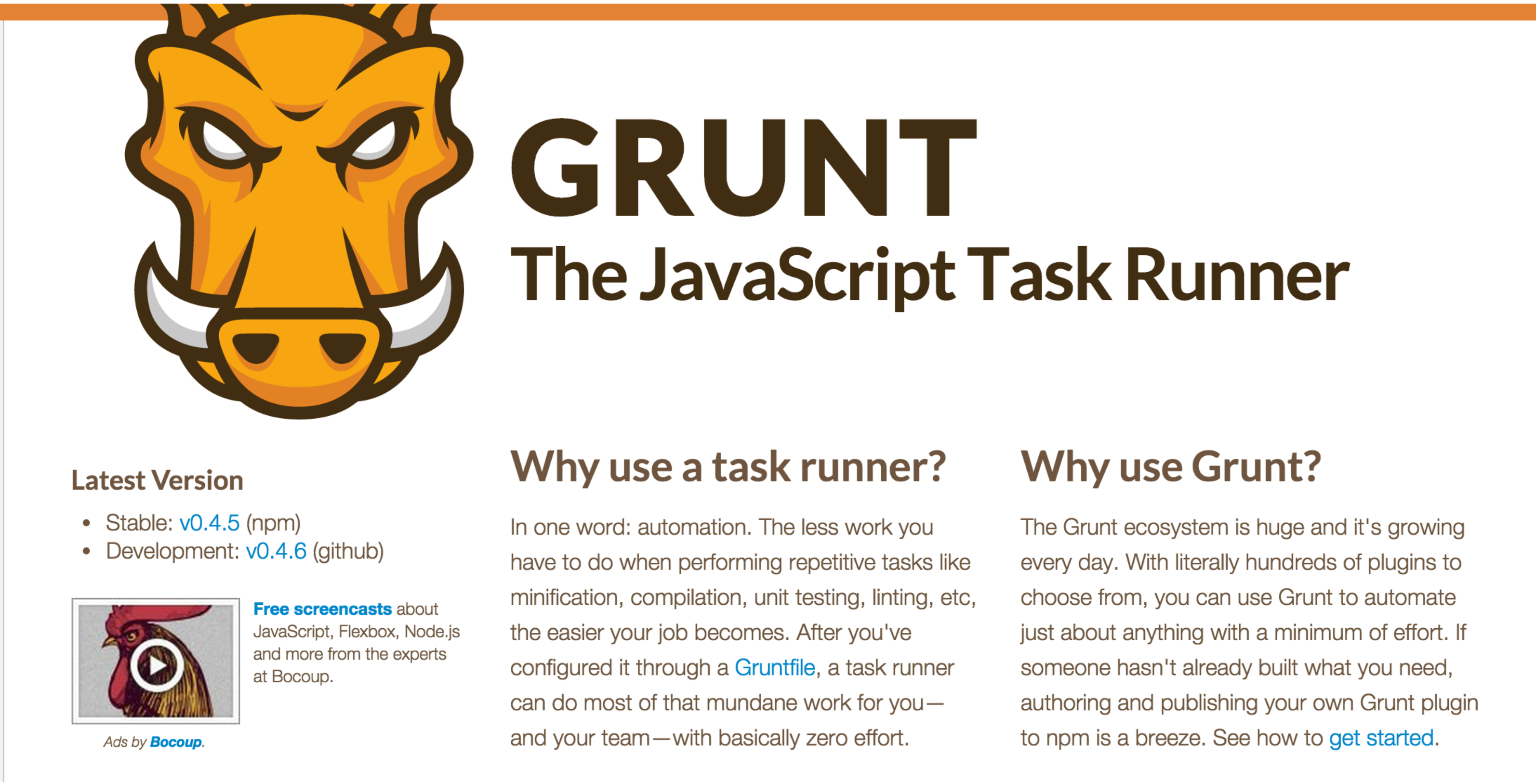
Make

™

<APACHE ANT>

gradle

maven



GRUNT

The JavaScript Task Runner

Latest Version

- Stable: v0.4.5 (npm)
- Development: v0.4.6 (github)

Free screencasts about JavaScript, Flexbox, Node.js and more from the experts at Bocoup.

Ads by ***Bocoup***.

Why use a task runner?

In one word: automation. The less work you have to do when performing repetitive tasks like minification, compilation, unit testing, linting, etc, the easier your job becomes. After you've configured it through a Gruntfile, a task runner can do most of that mundane work for you—and your team—with basically zero effort.

Why use Grunt?

The Grunt ecosystem is huge and it's growing every day. With literally hundreds of plugins to choose from, you can use Grunt to automate just about anything with a minimum of effort. If someone hasn't already built what you need, authoring and publishing your own Grunt plugin to npm is a breeze. See how to get started.

http://gruntjs.com/sample-gruntfile

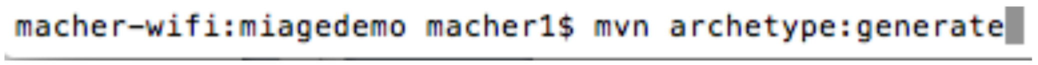
Docs Search pack

Bower

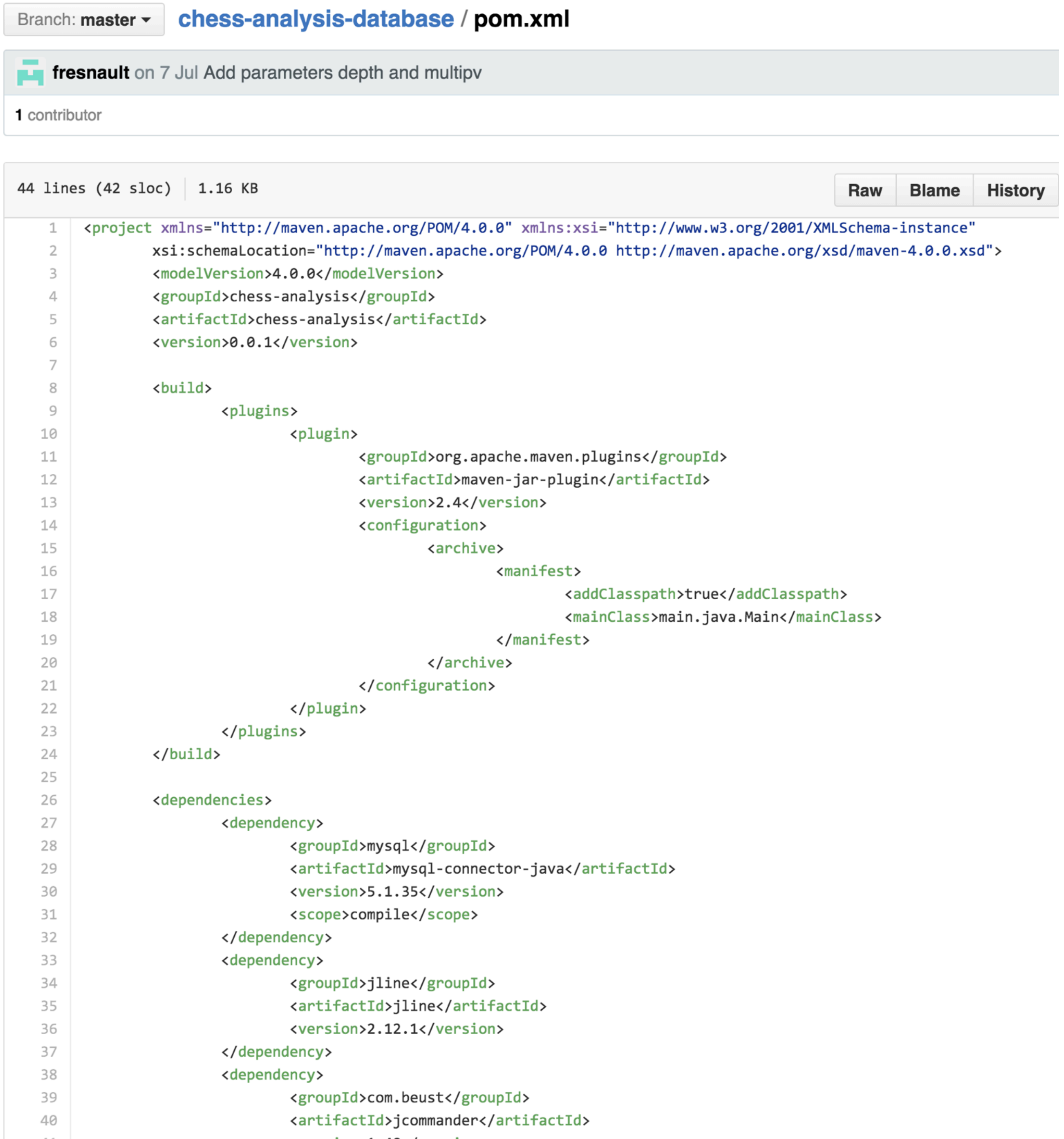
A package manager for the web

Chess project: also use Maven!

(either using an existing pom.xml or using an archetype)



```
macher-wifi:miagedemo macher1$ mvn archetype:generate
```


Branch: master ▾ chess-analysis-database / pom.xml

fresnault on 7 Jul Add parameters depth and multipv

1 contributor

44 lines (42 sloc) | 1.16 KB

```xml
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
        <modelVersion>4.0.0</modelVersion>
        <groupId>chess-analysis</groupId>
        <artifactId>chess-analysis</artifactId>
        <version>0.0.1</version>

        <build>
                <plugins>
                        <plugin>
                                <groupId>org.apache.maven.plugins</groupId>
                                <artifactId>maven-jar-plugin</artifactId>
                                <version>2.4</version>
                                <configuration>
                                        <archive>
                                                <manifest>
                                                        <addClasspath>true</addClasspath>
                                                        <mainClass>main.java.Main</mainClass>
                                                </manifest>
                                        </archive>
                                </configuration>
                        </plugin>
                </plugins>
        </build>

        <dependencies>
                <dependency>
                        <groupId>mysql</groupId>
                        <artifactId>mysql-connector-java</artifactId>
                        <version>5.1.35</version>
                        <scope>compile</scope>
                </dependency>
                <dependency>
                        <groupId>jline</groupId>
                        <artifactId>jline</artifactId>
                        <version>2.12.1</version>
                </dependency>
                <dependency>
                        <groupId>com.beust</groupId>
                        <artifactId>jcommander</artifactId>
```

Today

- Build System (maven)
- Manage your source code
- Refactoring
- Logging, Debugging and Test
- IDE (eg, Eclipse)
- Workflow: git, intégration continue, et tous les points ci-dessous

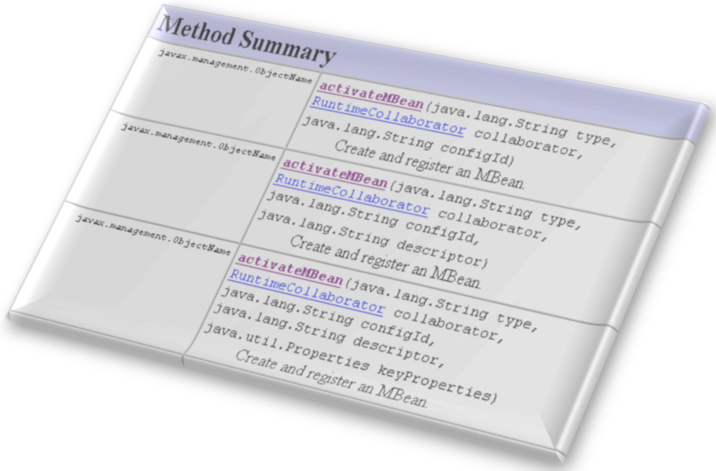
Manage your source code

Documentation

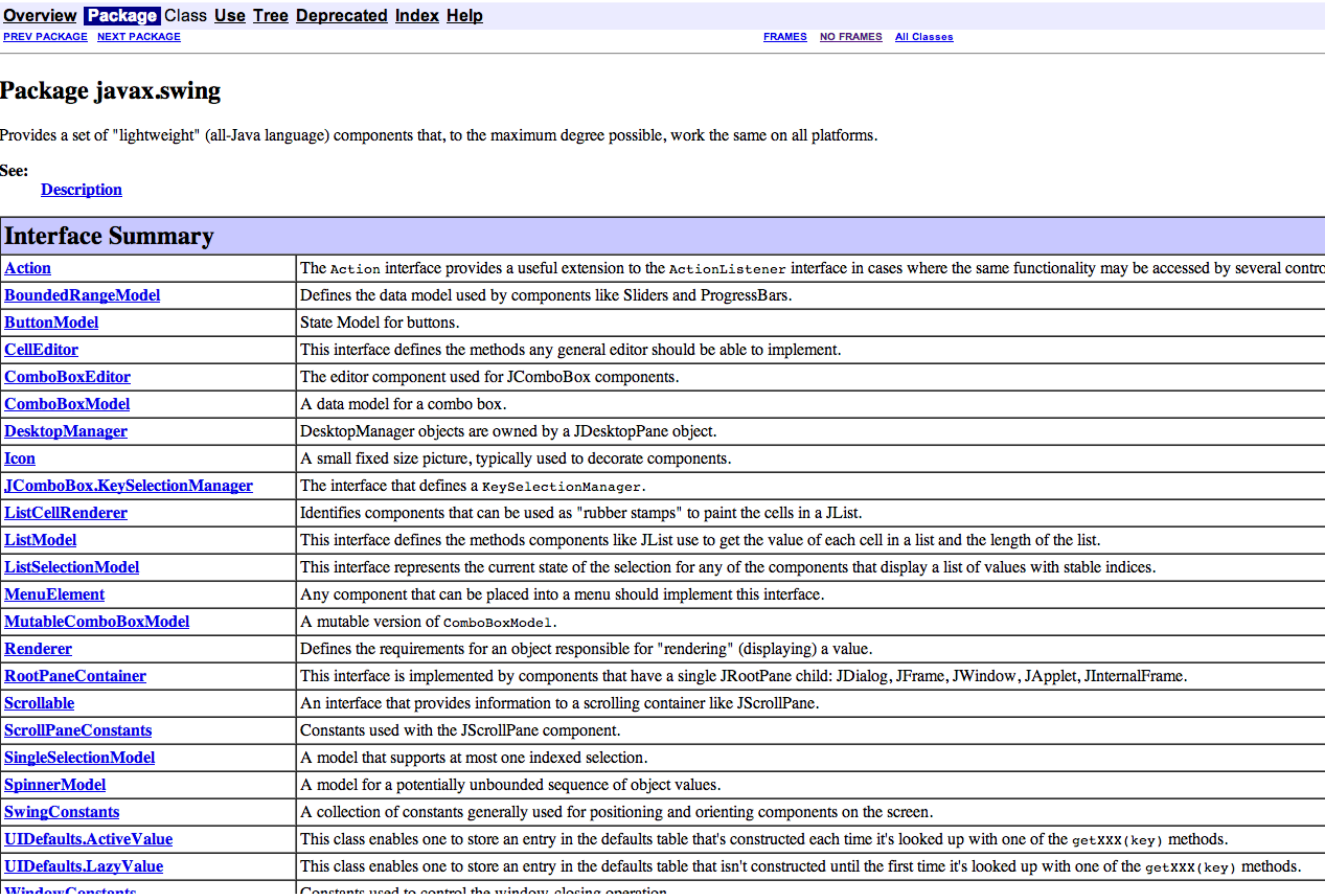
- Source code: one of the best artefact for documenting a project
- Javadoc (JDK)
  - Automatic **generation** of HTML documentation
  - Using comments in java files
- Syntax

```
/**
 * This is a <b>doc</b> comment.
 * @see java.lang.Object
 * @todo fix {@underline this !}
 */
```

- Includes
  - class hierarchy, interfaces, packages
  - detailed summary of class, interface, methods, attributes
- Note
  - Add doc generation to your favorite **compile chain**



Method Summary	
javax.management.ObjectName	activateMBean(java.lang.String type, RuntimeCollaborator collaborator, java.lang.String configId) Create and register an MBean.
javax.management.ObjectName	activateMBean(java.lang.String type, RuntimeCollaborator collaborator, java.lang.String configId, java.lang.String descriptor) Create and register an MBean.
javax.management.ObjectName	activateMBean(java.lang.String type, RuntimeCollaborator collaborator, java.lang.String configId, java.lang.String descriptor, java.util.Properties keyProperties) Create and register an MBean.



Overview **Package** Class Use Tree Deprecated Index Help

PREV PACKAGE NEXT PACKAGE FRAMES NO FRAMES All Classes

Package javax.swing

Provides a set of "lightweight" (all-Java language) components that, to the maximum degree possible, work the same on all platforms.

See:
Description

Interface Summary	
Action	The `Action` interface provides a useful extension to the `ActionListener` interface in cases where the same functionality may be accessed by several contro
BoundedRangeModel	Defines the data model used by components like Sliders and ProgressBars.
ButtonModel	State Model for buttons.
CellEditor	This interface defines the methods any general editor should be able to implement.
ComboBoxEditor	The editor component used for JComboBox components.
ComboBoxModel	A data model for a combo box.
DesktopManager	DesktopManager objects are owned by a JDesktopPane object.
Icon	A small fixed size picture, typically used to decorate components.
JComboBox.KeySelectionManager	The interface that defines a `KeySelectionManager`.
ListCellRenderer	Identifies components that can be used as "rubber stamps" to paint the cells in a JList.
ListModel	This interface defines the methods components like JList use to get the value of each cell in a list and the length of the list.
ListSelectionModel	This interface represents the current state of the selection for any of the components that display a list of values with stable indices.
MenuElement	Any component that can be placed into a menu should implement this interface.
MutableComboBoxModel	A mutable version of `ComboBoxModel`.
Renderer	Defines the requirements for an object responsible for "rendering" (displaying) a value.
RootPaneContainer	This interface is implemented by components that have a single JRootPane child: JDialog, JFrame, JWindow, JApplet, JInternalFrame.
Scrollable	An interface that provides information to a scrolling container like JScrollPane.
ScrollPaneConstants	Constants used with the JScrollPane component.
SingleSelectionModel	A model that supports at most one indexed selection.
SpinnerModel	A model for a potentially unbounded sequence of object values.
SwingConstants	A collection of constants generally used for positioning and orienting components on the screen.
UIDefaults.ActiveValue	This class enables one to store an entry in the defaults table that's constructed each time it's looked up with one of the `getXXX(key)` methods.
UIDefaults.LazyValue	This class enables one to store an entry in the defaults table that isn't constructed until the first time it's looked up with one of the `getXXX(key)` methods.
WindowConstants	Constants used to control the window-closing operation.

public class **JFrame**
extends Frame
implements WindowConstants, Accessible, RootPaneContainer

An extended version of `java.awt.Frame` that adds support for the JFC/Swing component architecture. You can find task-o

The `JFrame` class is slightly incompatible with `Frame`. Like all other JFC/Swing top-level containers, a `JFrame` contains a `JI`
the AWT `Frame` case. For example, to add a child to an AWT frame you'd write:

```
        frame.add(child);
```

However using `JFrame` you need to add the child to the `JFrame's` content pane instead:

```
        frame.getContentPane().add(child);
```

The same is true for setting layout managers, removing components, listing children, and so on. All these methods should no
exception. The default content pane will have a BorderLayout manager set on it.

update

```
public void update(Graphics g)
```

Just calls `paint(g)`. This method was overridden to prevent an unnecessary call to clear the background.

Overrides:

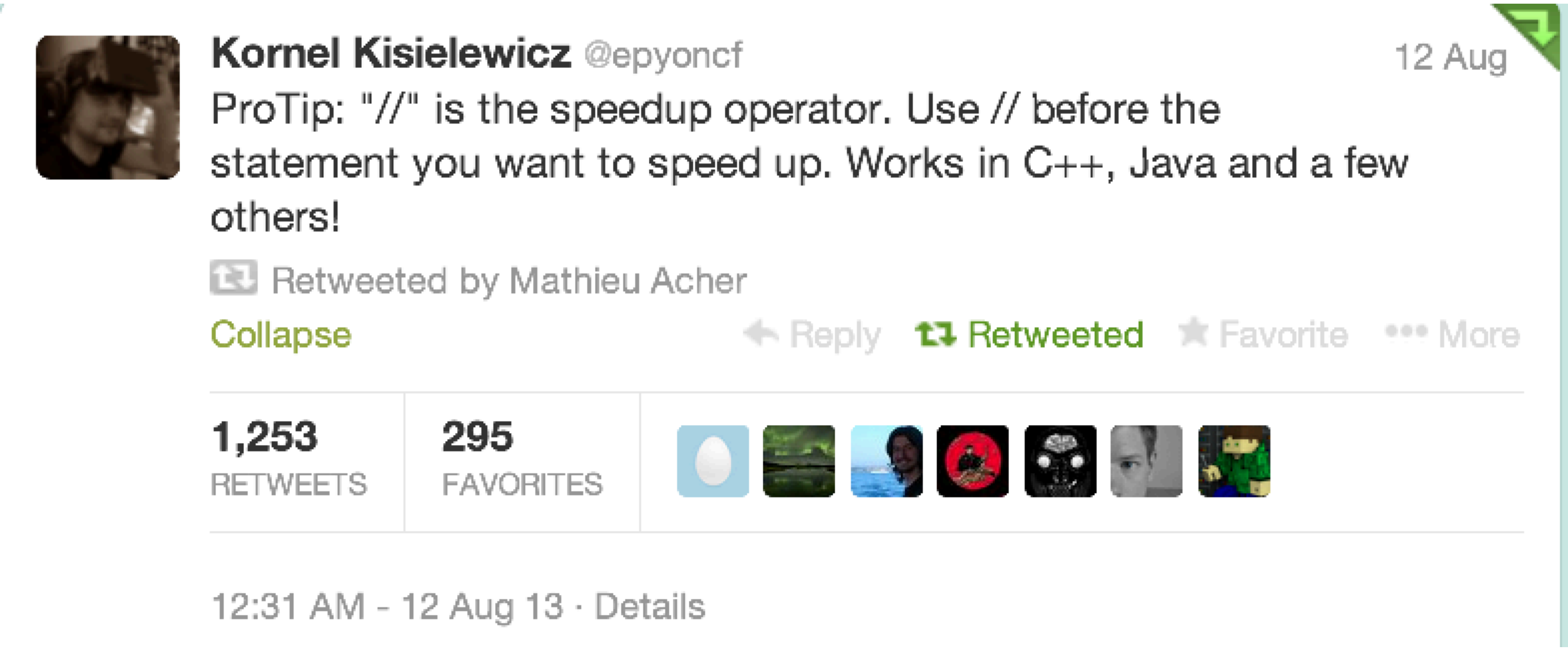
`update` in class `Container`

Parameters:

`g` - the Graphics context in which to paint

See Also:

`Component.update(Graphics)`


Kornel Kisielewicz @epyoncf 12 Aug

ProTip: "//" is the speedup operator. Use // before the statement you want to speed up. Works in C++, Java and a few others!

Retweeted by Mathieu Acher

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12:31 AM - 12 Aug 13 · Details

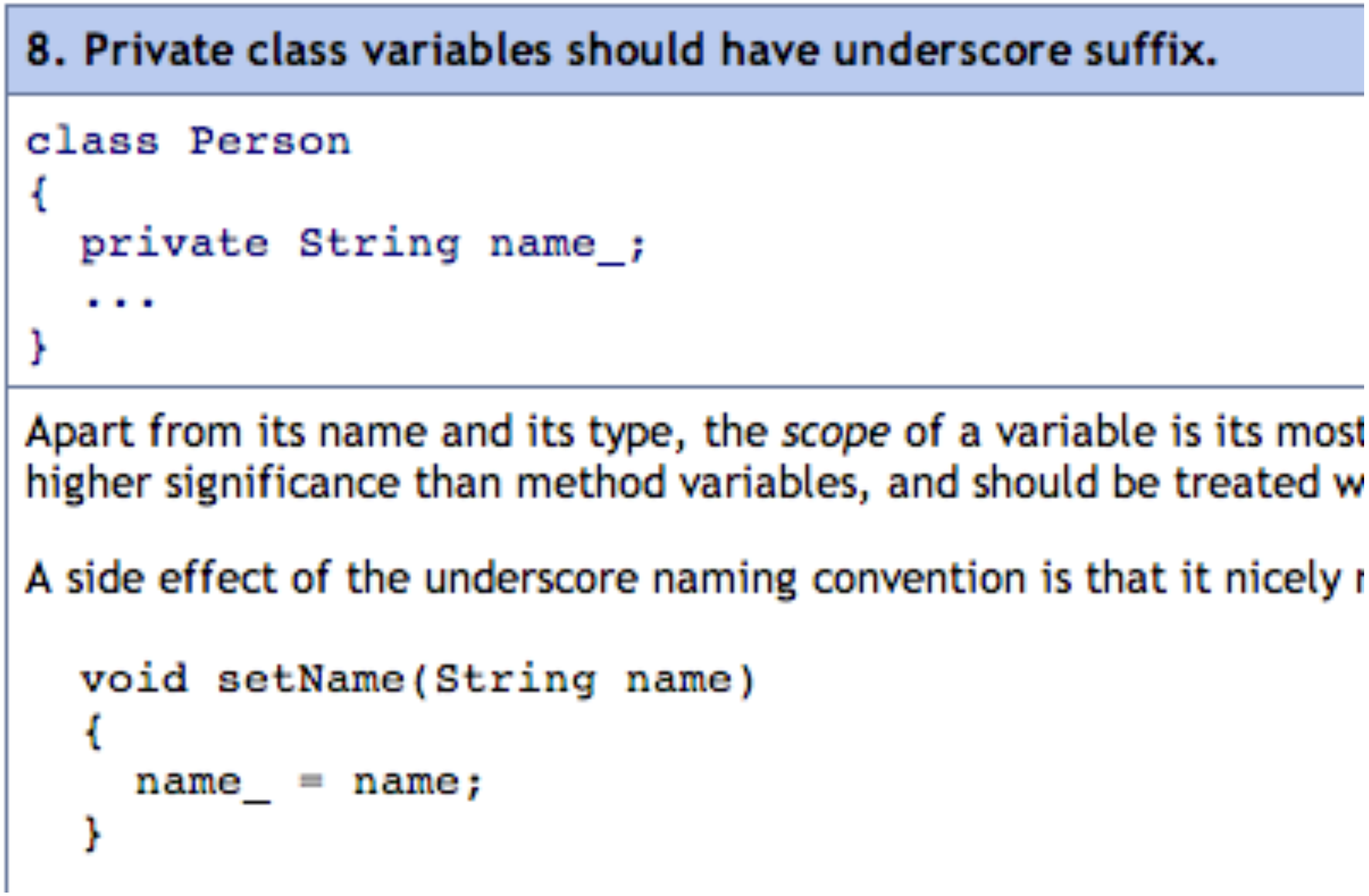
Coding Conventions

- Rules on the coding style :
  - Apache, Oracle and others template
    - e.g. http://www.oracle.com/technetwork/java/codeconv-138413.html
    - http://geosoft.no/development/javastyle.html
- Verification tools
  - CheckStyle, PMD, JackPot, Spoon Vsuite…
  - Some integrated into IDEs

Why Coding Standards are Important?

- Lead to greater **consistency** within your code and the code of your teammates
- Easier to **understand**
- Easier to **develop**
- Easier to **maintain**
- Reduces overall cost of application

Example



8. Private class variables should have underscore suffix.

```
class Person
{
  private String name_;
  ...
}
```

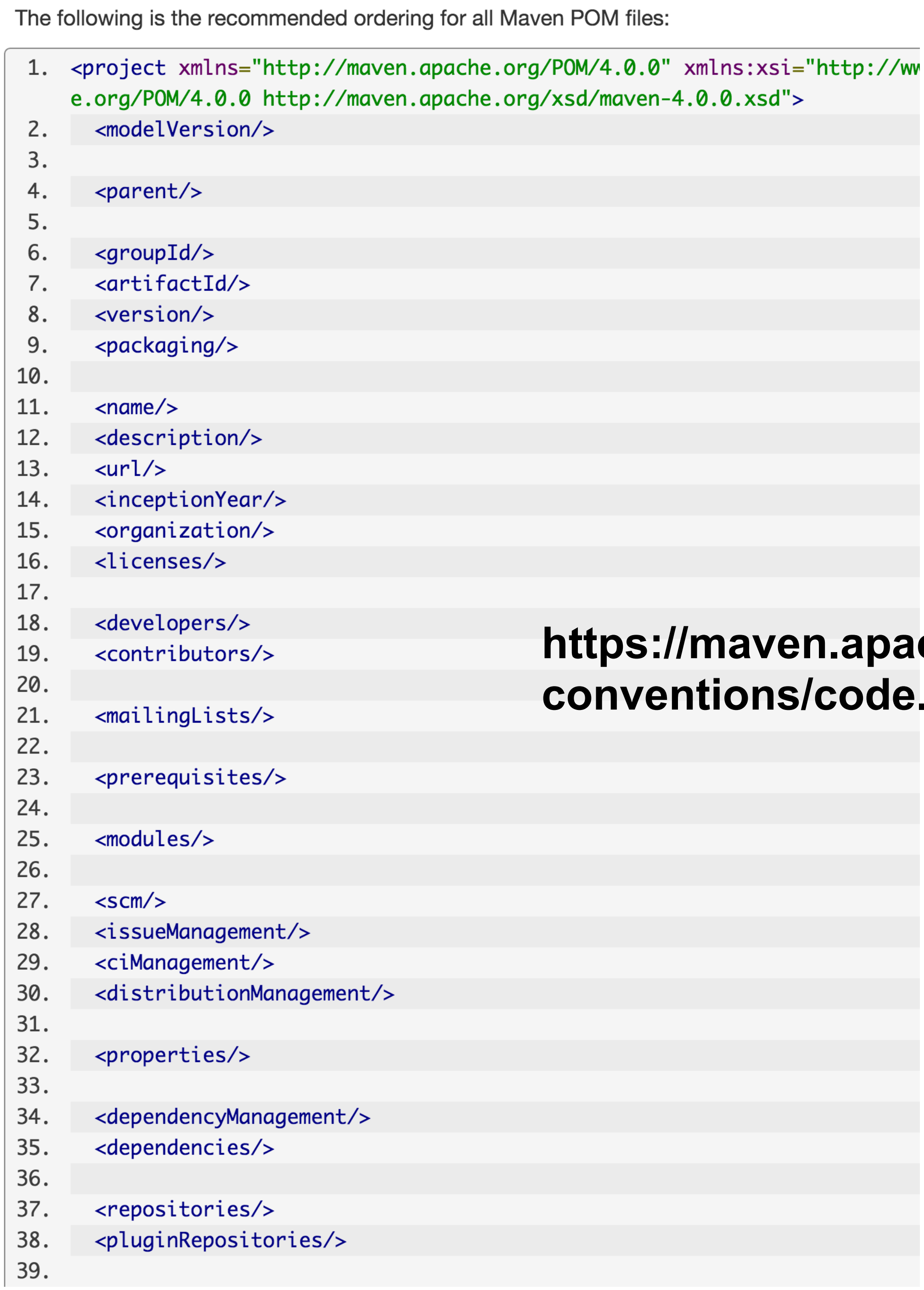
Apart from its name and its type, the *scope* of a variable is its most
higher significance than method variables, and should be treated w

A side effect of the underscore naming convention is that it nicely

```
  void setName(String name)
  {
    name_ = name;
  }
```

Code Style and Code Conventions: many languages (Java, XML, JavaScript, HTML, CSS, etc.)

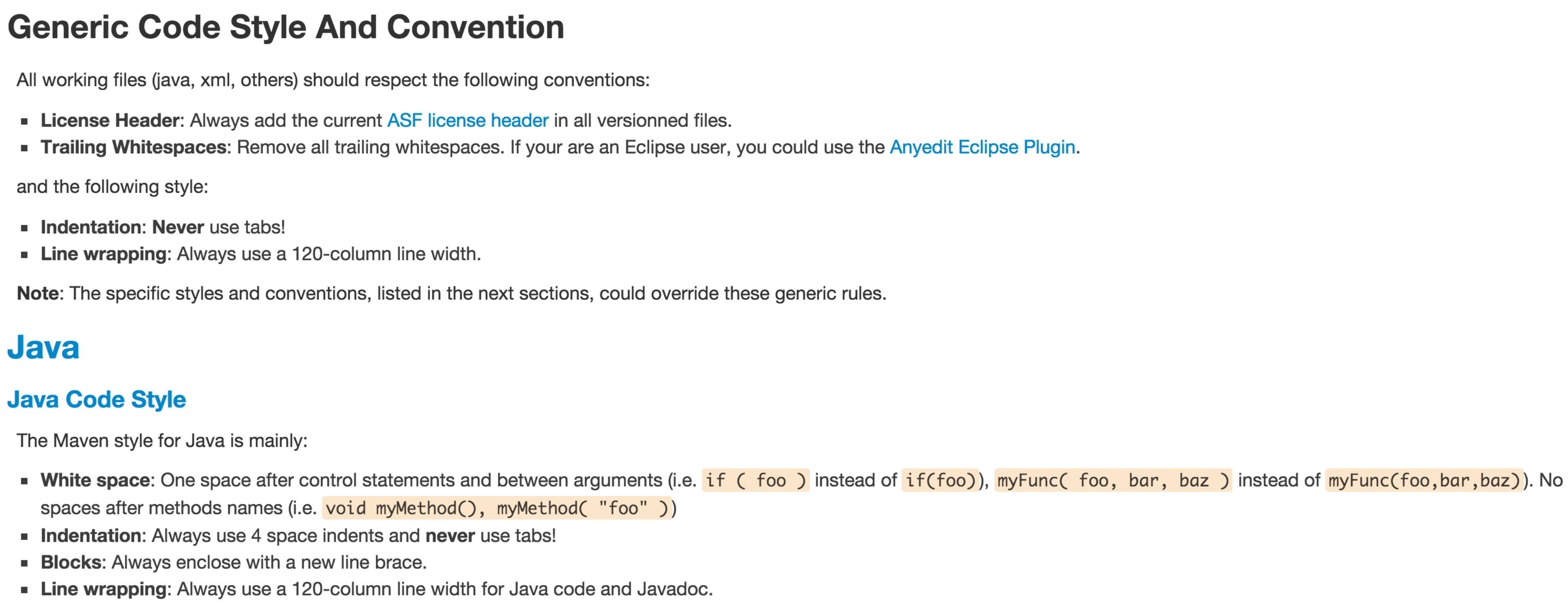
An example:
https://maven.apache.org/developers/conventions/code.html


The following is the recommended ordering for all Maven POM files:

```xml
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://ww
e.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion/>

  <parent/>

  <groupId/>
  <artifactId/>
  <version/>
  <packaging/>

  <name/>
  <description/>
  <url/>
  <inceptionYear/>
  <organization/>
  <licenses/>

  <developers/>
  <contributors/>

  <mailingLists/>

  <prerequisites/>

  <modules/>

  <scm/>
  <issueManagement/>
  <ciManagement/>
  <distributionManagement/>

  <properties/>

  <dependencyManagement/>
  <dependencies/>

  <repositories/>
  <pluginRepositories/>

```

https://maven.apache.org/developers/conventions/code.html

https://maven.apache.org/developers/conventions/code.html



Generic Code Style And Convention

All working files (java, xml, others) should respect the following conventions:

- **License Header**: Always add the current ASF license header in all versionned files.
- **Trailing Whitespaces**: Remove all trailing whitespaces. If your are an Eclipse user, you could use the Anyedit Eclipse Plugin.

and the following style:

- **Indentation**: **Never** use tabs!
- **Line wrapping**: Always use a 120-column line width.

Note: The specific styles and conventions, listed in the next sections, could override these generic rules.

Java

Java Code Style

The Maven style for Java is mainly:

- **White space**: One space after control statements and between arguments (i.e. `if ( foo )` instead of `if(foo)`), `myFunc( foo, bar, baz )` instead of `myFunc(foo,bar,baz)`). No spaces after methods names (i.e. `void myMethod(), myMethod( "foo" )`)
- **Indentation**: Always use 4 space indents and **never** use tabs!
- **Blocks**: Always enclose with a new line brace.
- **Line wrapping**: Always use a 120-column line width for Java code and Javadoc.

Tools to Improve your Source code

- Formatting tools
  - Indenteurs (Jindent), beautifiers, stylers (JavaStyle), …
- Code conventions/styles:
  - Eg Checkstyle
  - Exists as a Maven plugin (https://maven.apache.org/plugins/maven-checkstyle-plugin/)
- Quality report tools: code metrics
  - Number of Non Comment Code Source, Number of packages, Cyclomatic numbers, …
    - JavaNCCS, Eclipse Metrics …

Today

- Build System (maven)
- Manage your source code
- Refactoring
- Logging, Debugging and Test
- IDE (eg, Eclipse)
- Workflow: git, intégration continue, et tous les points ci-dessous

Refactoring

What's Code Refactoring?

"A series of *small* steps, each of which changes the program's *internal structure* without changing its *external behavior* "

Martin Fowler

Example

Which code segment is easier to read?

Sample 1:

```
if (markT>=0 && markT<=25 && markL>=0 && markL<=25){
       float markAvg = (markT + markL)/2;
       System.out.println("Your mark: " + markAvg);
}
```

Sample 2:

```
if (isValid(markT) && isValid(markL)){
       float markAvg = (markT + markL)/2;
       System.out.println("Your mark: " + mark);
}
```

Why do we Refactor?

- Improves the design of our software
  - Design pattern!
- Minimizes technical debt
- Keep development at speed
- To make the software easier to understand
- To help find bugs
- To “Fix broken windows”

Non exhaustive (code smell)

(and not necessarily smells in all situations)

- Duplicated code
- Feature Envy
- Inappropriate Intimacy
- Comments
- Long Method
- Long Parameter List
- Switch Statements
- Improper Naming

Code Smell examples (1)

```
public void display(String[] names) {
    System.out.println(“---------------");
    for(int i=0; i<names.length; i++){
        System.out.println(“ + " + names[i]);
    }
    System.out.println(“---------------");
}

public void listMember(String[] names) {
    System.out.println(“List all member: ”);
    System.out.println(“---------------");
    for(int i=0; i<names.length; i++){
        System.out.println(“ + " + names[i]);
    }
    System.out.println(“---------------");
}
```

Duplicated code

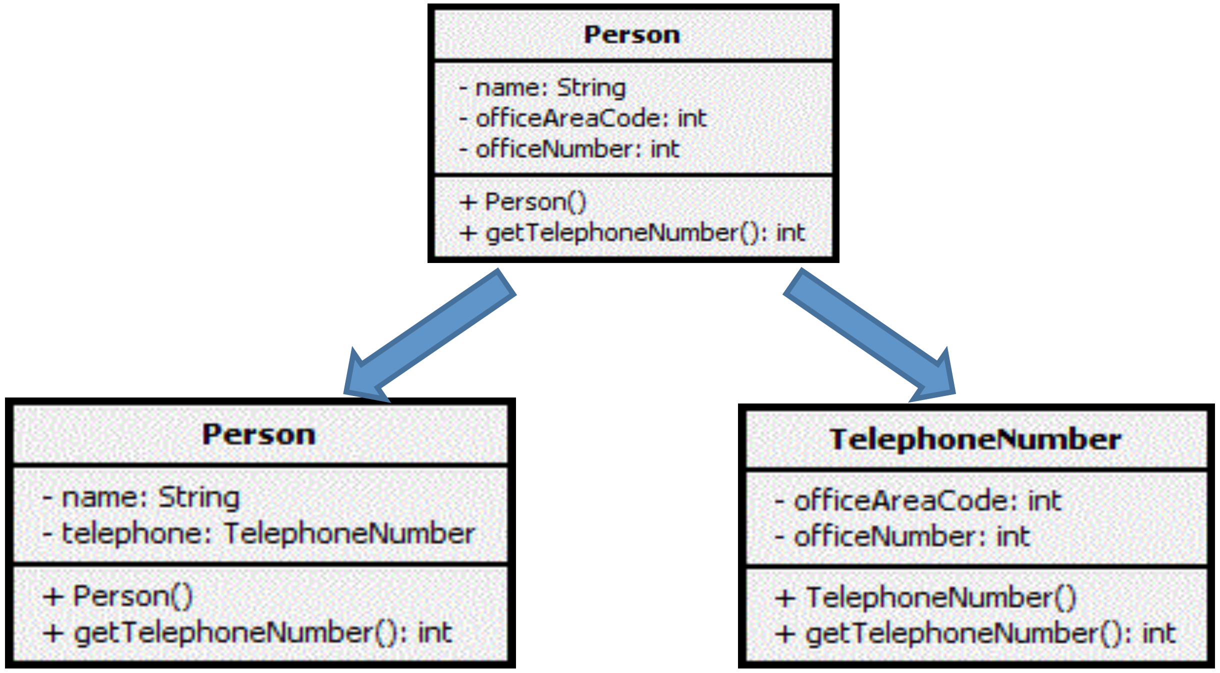
Code Smell examples (2)

```
public String formatStudent( int id,
                             String name,
                             Date dob,
                             String province,
                             String address,
                             String phone ){
   //TODO:
   return null;
}
```

Long list of parameters

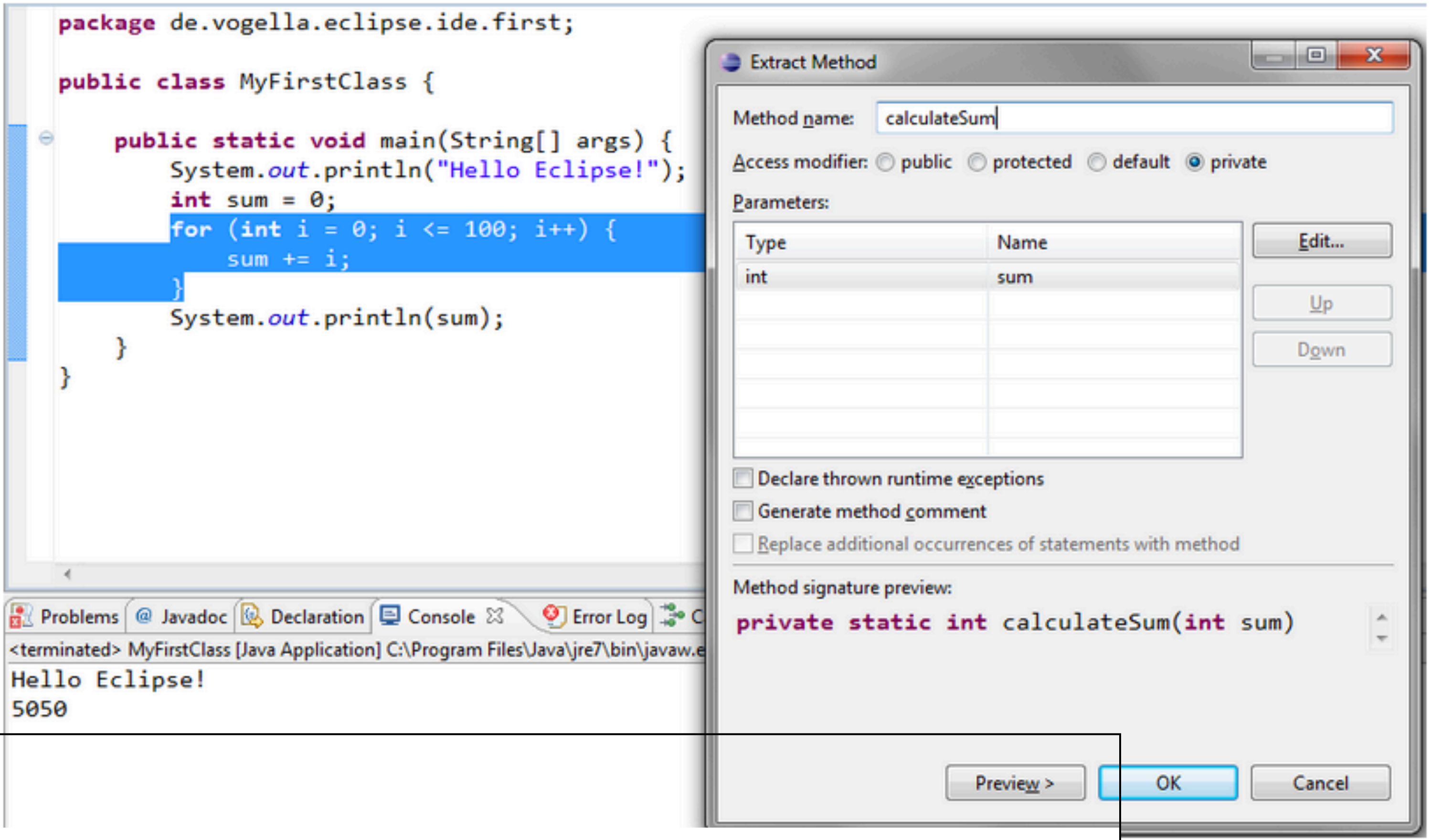
Improving design

- Move Method or Move Field – move to a more appropriate Class or source file
- Rename Method or Rename Field – changing the name into a new one that better reveals its purpose
  - Pull Up – in OOP, move to a superclass
  - Push Down – in OOP, move to a subclass



How do we Refactor?

- Manual Refactoring
  - Code Smells
- Automated/Assisted Refactoring
  - Refactoring by hand is time consuming and prone to error
  - Tools (IDE)
- In either case, **test your changes**



```
package de.vogella.eclipse.ide.first;

public class MyFirstClass {

    public static void main(String[] args) {
        System.out.println("Hello Eclipse!");
        int sum = 0;
        for (int i = 0; i <= 100; i++) {
            sum += i;
        }
        System.out.println(sum);
    }
}
```

```
<terminated> MyFirstClass [Java Application] C:\Program Files\Java\jre7\bin\javaw.e
Hello Eclipse!
5050
```

Method name: calculateSum

Access modifier: public protected default [✓ private]

Parameters:

Type	Name
int	sum

Declare thrown runtime exceptions

Generate method comment

Replace additional occurrences of statements with method

Method signature preview:

```
private static int calculateSum(int sum)
```

```
package de.vogella.eclipse.ide.first;

public class MyFirstClass {

  public static void main(String[] args) {
    System.out.println("Hello Eclipse!");
    int sum = 0;
    sum = calculateSum(sum);
    System.out.println(sum);
  }

  private static int calculateSum(int sum) {
    for (int i = 0; i <= 100; i++) {
      sum += i;
    }
    return sum;
  }
}
```

Typical refactoring patterns

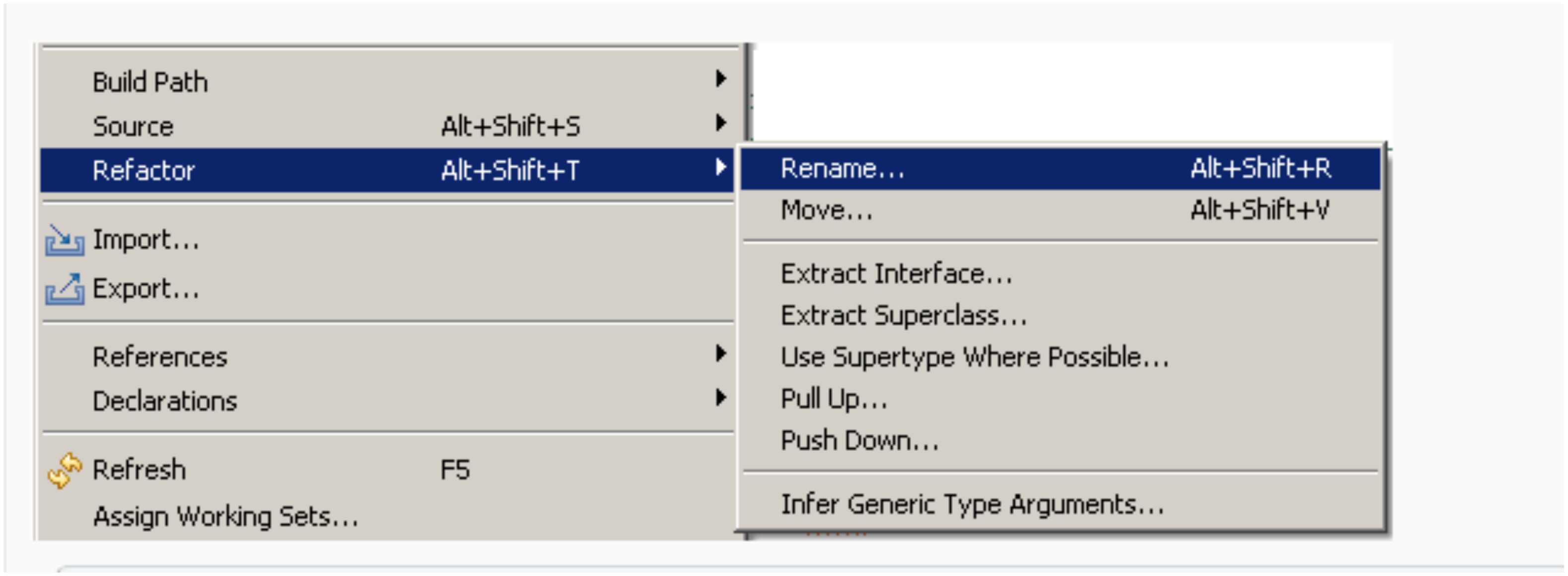
– Rename variable / class / method / member

– Extract method

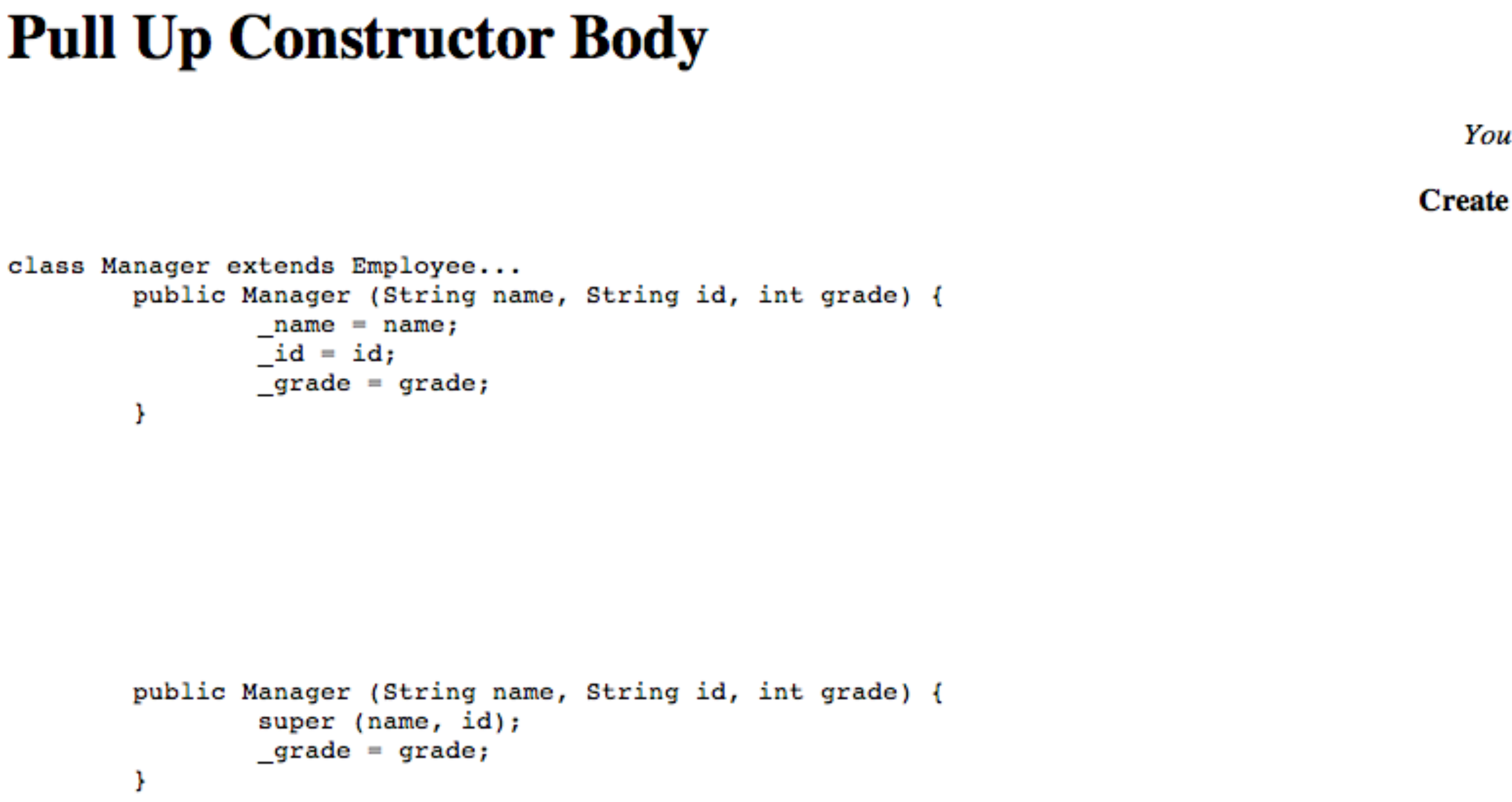
– Extract constant

– Extract interface

– Encapsulate field



You have constructors on subclasses with mostly identical bodies.
Create a superclass constructor; call this from the subclass methods.



Pull Up Constructor Body

You

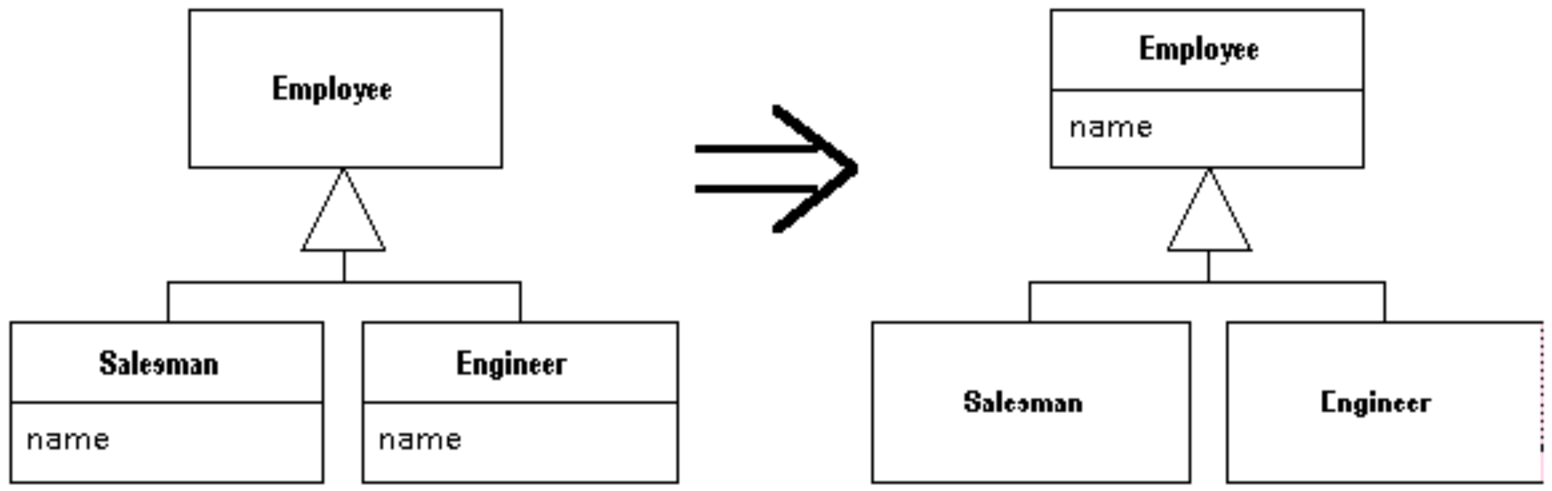
Create

```
class Manager extends Employee...
        public Manager (String name, String id, int grade) {
                _name = name;
                _id = id;
                _grade = grade;
        }
```

```
        public Manager (String name, String id, int grade) {
                super (name, id);
                _grade = grade;
        }
```

Two subclasses have the same field.

Move the field to the superclass.



You have a complicated expression.

Put the result of the expression, or parts of the expression, in a temporary variable with a name that explains the purpose.

```
if ( (platform.toUpperCase().indexOf("MAC") > -1) &&
      (browser.toUpperCase().indexOf("IE") > -1) &&
       wasInitialized() && resize > 0 )
 {
   // do something
 }
```

```
final boolean isMacOs     = platform.toUpperCase().indexOf("MAC") > -1;
final boolean isIEBrowser = browser.toUpperCase().indexOf("IE")  > -1;
final boolean wasResized  = resize > 0;

if (isMacOs && isIEBrowser && wasInitialized() && wasResized)
{
        // do something
}
```

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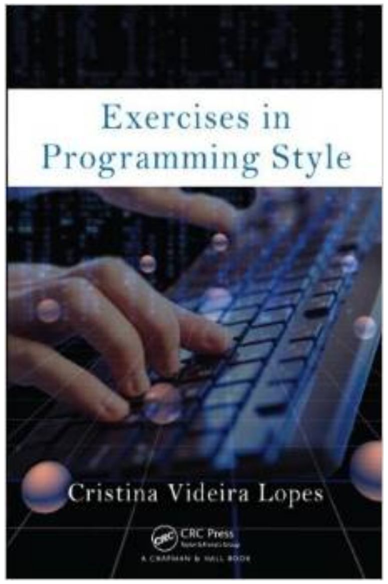
Logging, Debugging, Testing

Given a text file, output a list of the N most frequently-occurring non stop, words, ordered by decreasing frequency



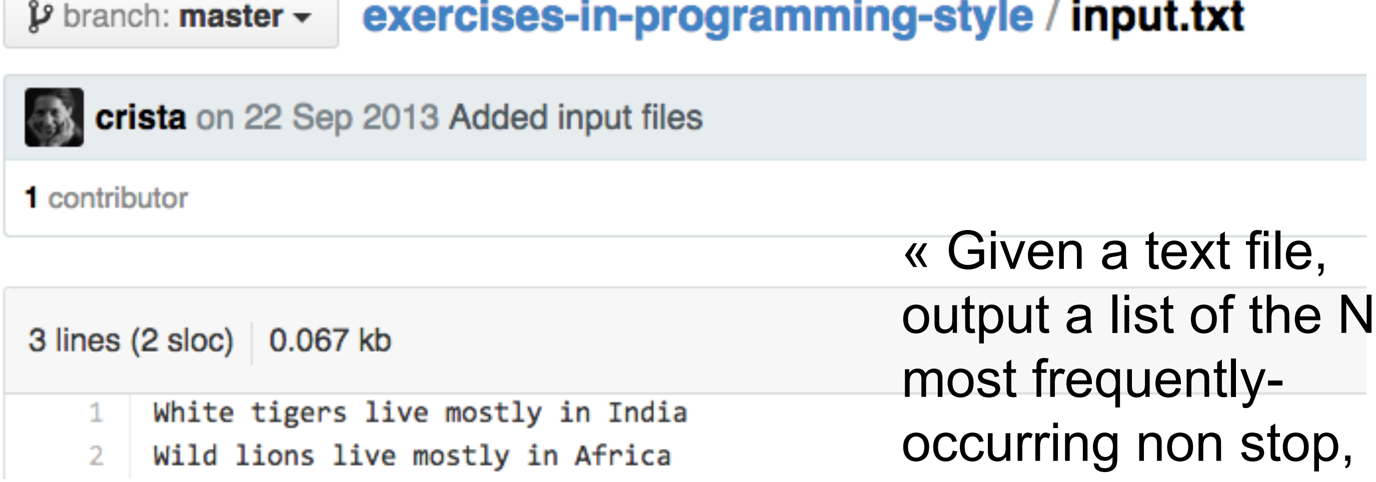
N: integer

I2: File

O1: string

N=25

I2=



branch: master exercises-in-programming-style / input.txt

crista on 22 Sep 2013 Added input files

1 contributor

3 lines (2 sloc) 0.067 kb

```
White tigers live mostly in India
Wild lions live mostly in Africa
```

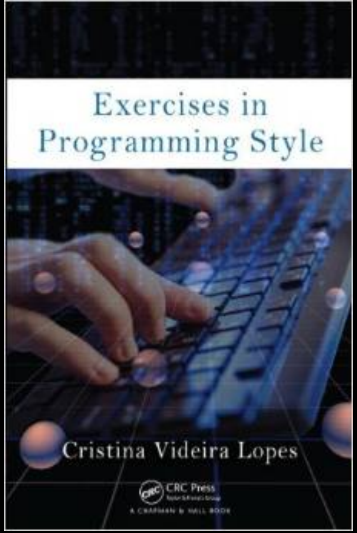
« Given a text file, output a list of the N most frequently-occurring non stop, words, ordered by decreasing frequency »

O1=
« live - 2
mostly - 2
africa - 1
india - 1
lions - 1
tigers - 1
white - 1
wild - 1 »

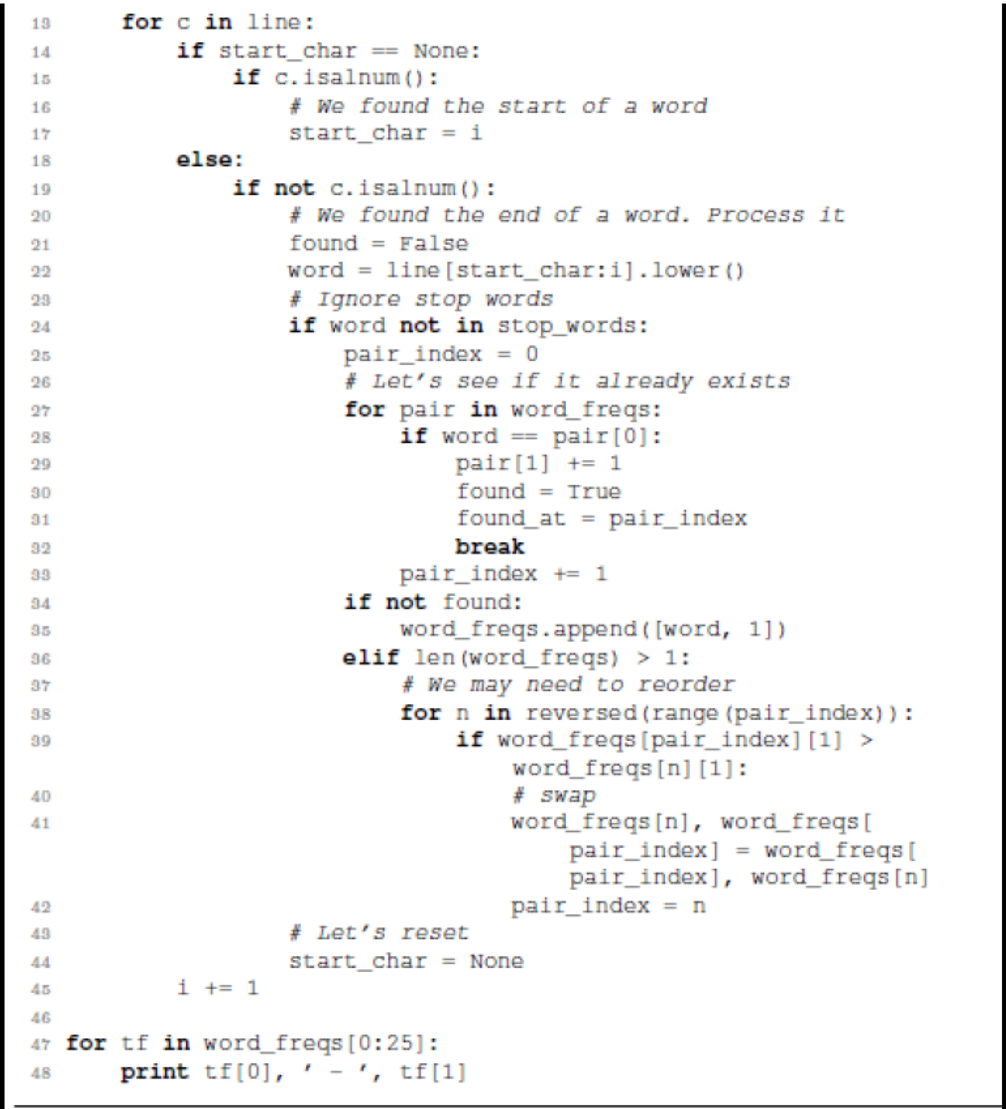
```
import sys, string
# the global list of [word, frequency] pairs
word_freqs = []
# the list of stop words
with open('../stop_words.txt') as f:
    stop_words = f.read().split(',')
stop_words.extend(list(string.ascii_lowercase))

# iterate through the file one line at a time
for line in open(sys.argv[1]):
    start_char = None
    i = 0
    for c in line:
        if start_char == None:
            if c.isalnum():
                # We found the start of a word
                start_char = i
        else:
            if not c.isalnum():
                # We found the end of a word. Process it
                found = False
                word = line[start_char:i].lower()
                # Ignore stop words
                if word not in stop_words:
                    pair_index = 0
                    # Let's see if it already exists
                    for pair in word_freqs:
                        if word == pair[0]:
                            pair[1] += 1
                            found = True
                            found_at = pair_index
                            break
                        pair_index += 1
                    if not found:
                        word_freqs.append([word, 1])
                    elif len(word_freqs) > 1:
                        # We may need to reorder
                        for n in reversed(range(pair_index)):
                            if word_freqs[pair_index][1] >
                                word_freqs[n][1]:
                                # swap
                                word_freqs[n], word_freqs[
                                    pair_index] = word_freqs[
                                    pair_index], word_freqs[n]
                                pair_index = n
                # Let's reset
                start_char = None
        i += 1

for tf in word_freqs[0:25]:
    print tf[0], ' - ', tf[1]
```



```
# the global list of [word, frequency] pairs
word_freqs = []
# the list of stop words
with open('../stop_words.txt') as f:
    stop_words = f.read().split(',')
stop_words.extend(list(string.ascii_lowercase))
```



```
    for c in line:
        if start_char == None:
            if c.isalnum():
                # We found the start of a word
                start_char = i
        else:
            if not c.isalnum():
                # We found the end of a word. Process it
                found = False
                word = line[start_char:i].lower()
                # Ignore stop words
                if word not in stop_words:
                    pair_index = 0
                    # Let’s see if it already exists
                    for pair in word_freqs:
                        if word == pair[0]:
                            pair[1] += 1
                            found = True
                            found_at = pair_index
                            break
                        pair_index += 1
                    if not found:
                        word_freqs.append([word, 1])
                    elif len(word_freqs) > 1:
                        # We may need to reorder
                        for n in reversed(range(pair_index)):
                            if word_freqs[pair_index][1] >
                                word_freqs[n][1]:
                                # swap
                                word_freqs[n], word_freqs[
                                    pair_index] = word_freqs[
                                    pair_index], word_freqs[n]
                                pair_index = n
                # Let’s reset
                start_char = None
        i += 1

for tf in word_freqs[0:25]:
    print tf[0], ’ - ’, tf[1]
```

```python
import sys, string
# the global list of [word, frequency] pairs
word_freqs = []
# the list of stop words
with open('../stop_words.txt') as f:
    stop_words = f.read().split(',')
```

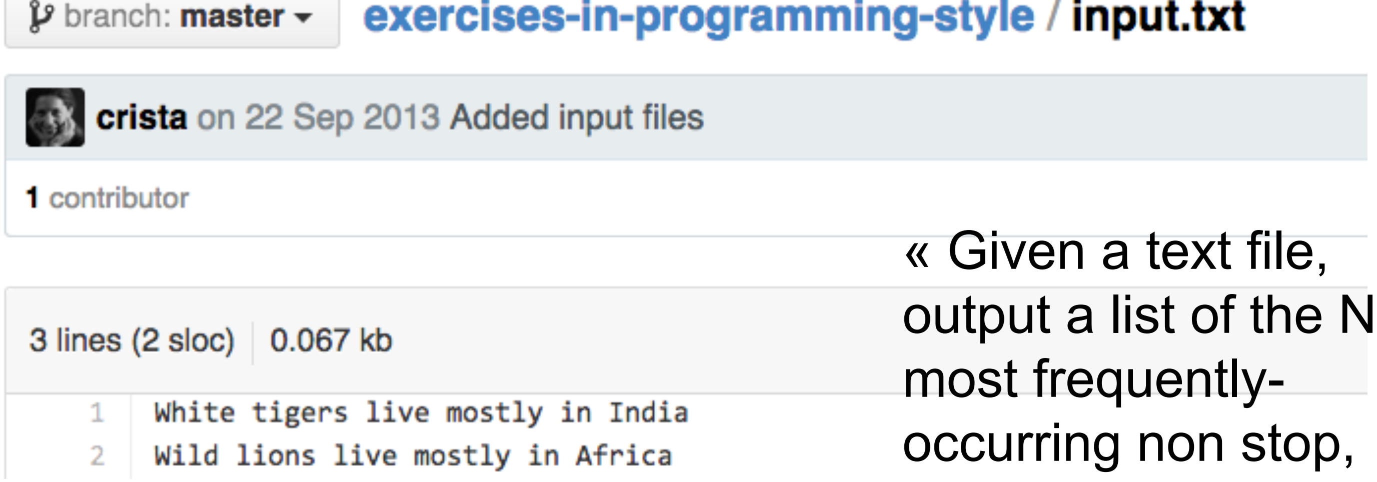
```python
for line in open(sys.argv[1]):
```

```python
for c in line:
```

```python
            if not c.isalnum():
                # We found the end of a word. Process it
                found = False
                word = line[start_char:i].lower()
                # Ignore stop words
                if word not in stop_words:
                    pair_index = 0
                    # Let's see if it already exists
                    for pair in word_freqs:
                        if word == pair[0]:
                            pair[1] += 1
                            found = True
                            found_at = pair_index
                            break
                        pair_index += 1
                    if not found:
                        word_freqs.append([word, 1])
                    elif len(word_freqs) > 1:
                        # We may need to reorder
                        for n in reversed(range(pair_index)):
                            if word_freqs[pair_index][1] >
                                word_freqs[n][1]:
                                # swap
                                word_freqs[n], word_freqs[
                                    pair_index] = word_freqs[
                                    pair_index], word_freqs[n]
                                pair_index = n
                # Let's reset
                start_char = None
        i += 1

for tf in word_freqs[0:25]:
    print tf[0], ' - ', tf[1]
```

N=25


branch: master exercises-in-programming-style / input.txt

crista on 22 Sep 2013 Added input files

1 contributor

3 lines (2 sloc) | 0.067 kb

```
White tigers live mostly in India
Wild lions live mostly in Africa
```

I2=

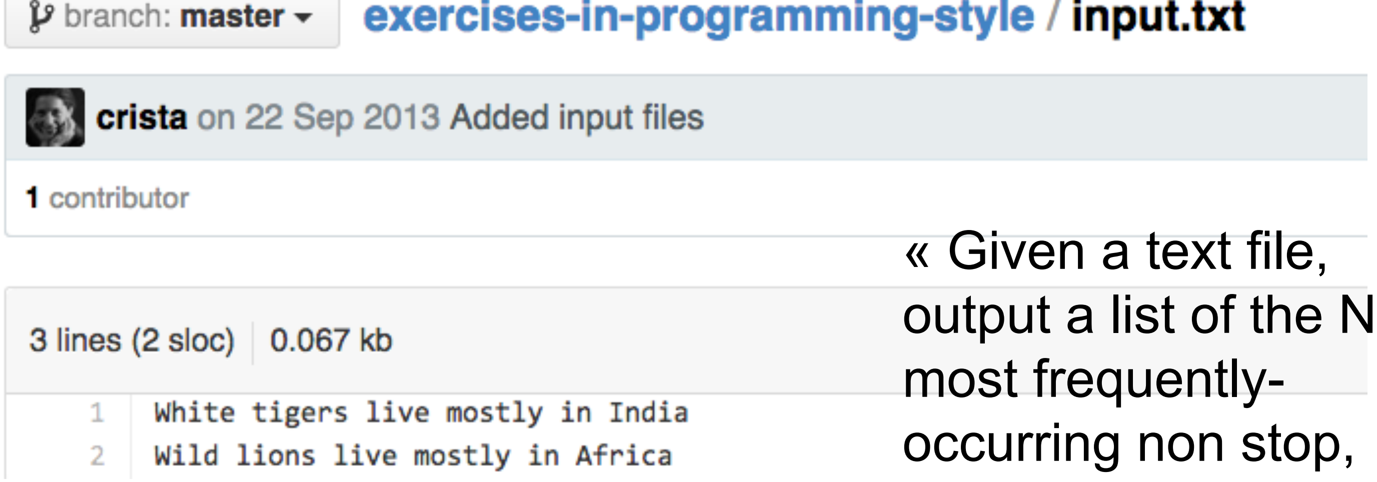
« Given a text file, output a list of the N most frequently-occurring non stop, words, ordered by decreasing frequency »

O1=
« live - 2
mostly - 2
africa - 1
india - 1
lions - 1
tigers - 3
white - 1
wild - 1 »

Let say…

N=25

I2=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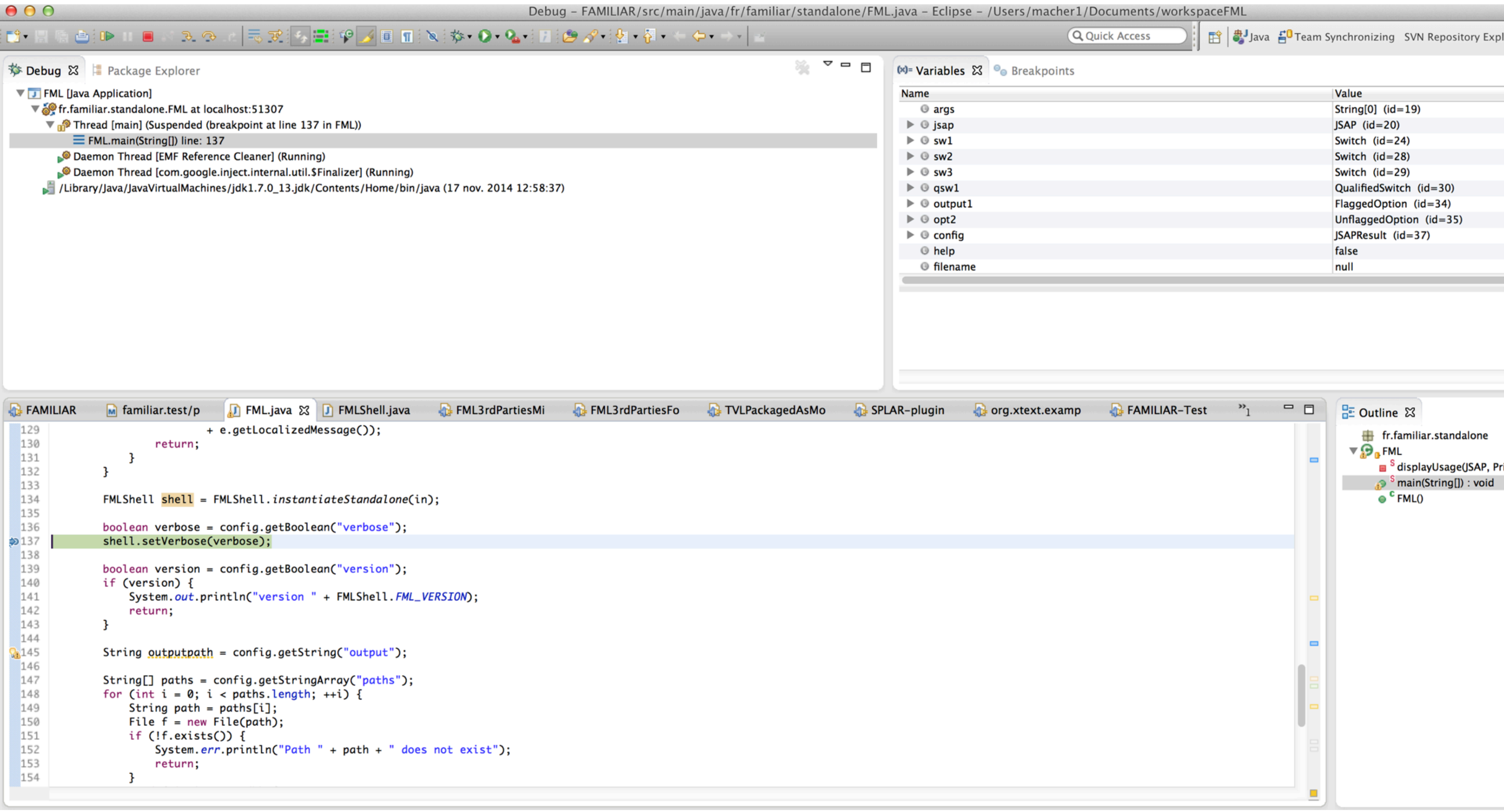
O1=
« live - 2
mostly - 2
africa - 1
india - 1
lions - 1
tigers - 3
white - 1
wild - 1 »

System.out.println (Logging)?
Debugging?
Profiling?
Testing?

Debugging



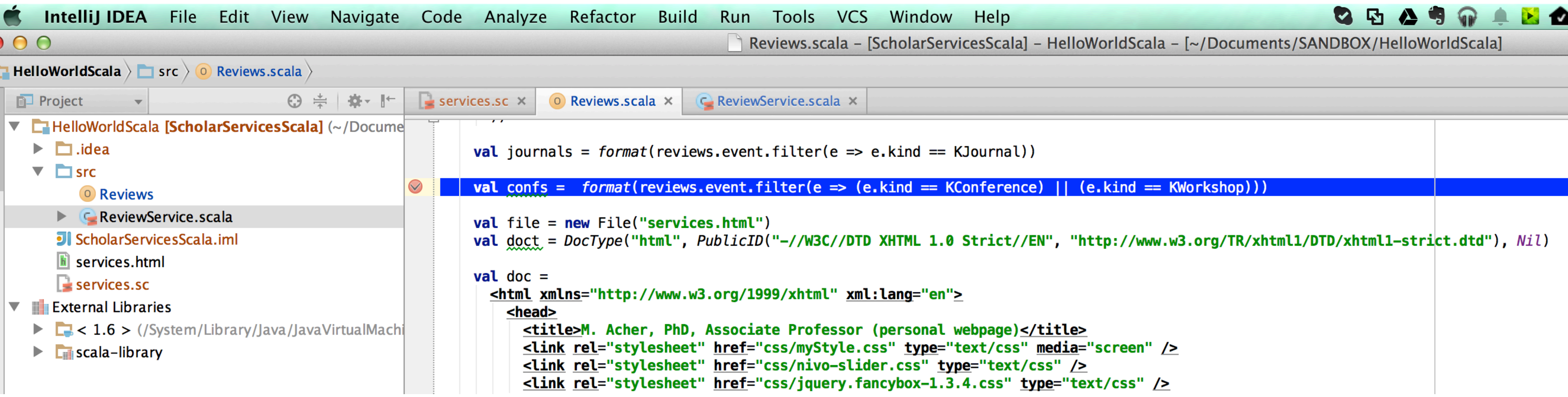
Debug – FAMILIAR/src/main/java/fr/familiar/standalone/FML.java – Eclipse – /Users/macher1/Documents/workspaceFML

```
FML [Java Application]
  fr.familiar.standalone.FML at localhost:51307
    Thread [main] (Suspended (breakpoint at line 137 in FML))
      FML.main(String[]) line: 137
    Daemon Thread [EMF Reference Cleaner] (Running)
    Daemon Thread [com.google.inject.internal.util.$Finalizer] (Running)
  /Library/Java/JavaVirtualMachines/jdk1.7.0_13.jdk/Contents/Home/bin/java (17 nov. 2014 12:58:37)
```

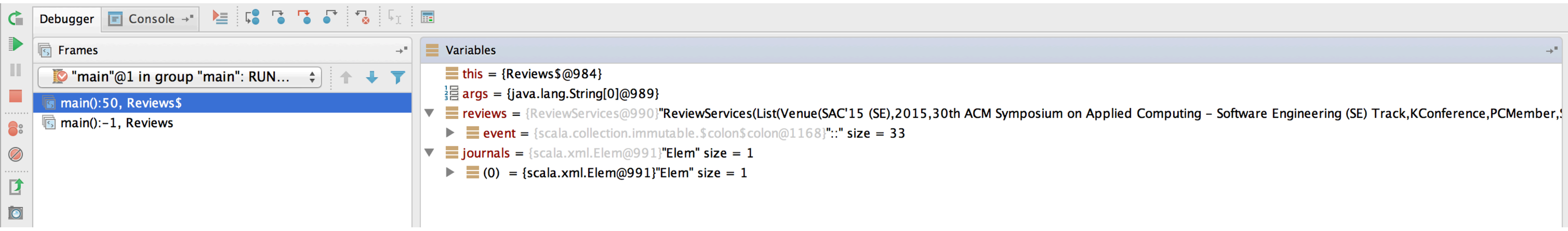
Name	Value
args	String[0] (id=19)
jsap	JSAP (id=20)
sw1	Switch (id=24)
sw2	Switch (id=28)
sw3	Switch (id=29)
qsw1	QualifiedSwitch (id=30)
output1	FlaggedOption (id=34)
opt2	UnflaggedOption (id=35)
config	JSAPResult (id=37)
help	false
filename	null

```
                + e.getLocalizedMessage());
            return;
        }
    }

    FMLShell shell = FMLShell.instantiateStandalone(in);

    boolean verbose = config.getBoolean("verbose");
    shell.setVerbose(verbose);

    boolean version = config.getBoolean("version");
    if (version) {
        System.out.println("version " + FMLShell.FML_VERSION);
        return;
    }

    String outputpath = config.getString("output");

    String[] paths = config.getStringArray("paths");
    for (int i = 0; i < paths.length; ++i) {
        String path = paths[i];
        File f = new File(path);
        if (!f.exists()) {
            System.err.println("Path " + path + " does not exist");
            return;
        }
```

```
fr.familiar.standalone
  FML
    displayUsage(JSAP, Pr
    main(String[]) : void
    FML()
```

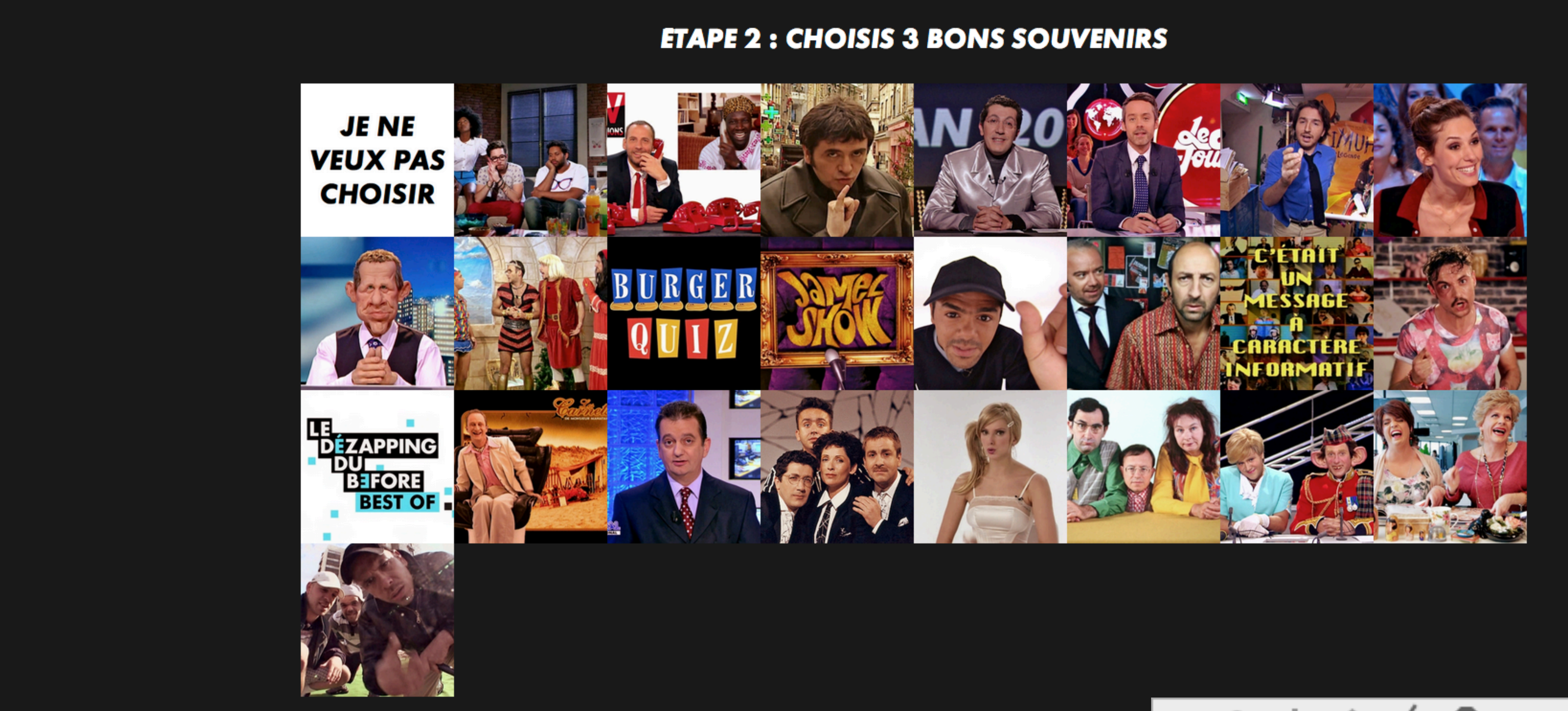

IntelliJ IDEA File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Reviews.scala - [ScholarServicesScala] - HelloWorldScala - [~/Documents/SANDBOX/HelloWorldScala]
HelloWorldScala src Reviews.scala
Project
services.sc
Reviews.scala
ReviewService.scala
HelloWorldScala [ScholarServicesScala] (~/Docume
.idea
src
Reviews
ReviewService.scala
ScholarServicesScala.iml
services.html
services.sc
External Libraries
< 1.6 > (/System/Library/Java/JavaVirtualMachi
scala-library

```
val journals = format(reviews.event.filter(e => e.kind == KJournal))

val confs =  format(reviews.event.filter(e => (e.kind == KConference) || (e.kind == KWorkshop)))

val file = new File("services.html")
val doct = DocType("html", PublicID("-//W3C//DTD XHTML 1.0 Strict//EN", "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd"), Nil)

val doc =
  <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en">
    <head>
      <title>M. Acher, PhD, Associate Professor (personal webpage)</title>
      <link rel="stylesheet" href="css/myStyle.css" type="text/css" media="screen" />
      <link rel="stylesheet" href="css/nivo-slider.css" type="text/css" />
      <link rel="stylesheet" href="css/jquery.fancybox-1.3.4.css" type="text/css" />
```

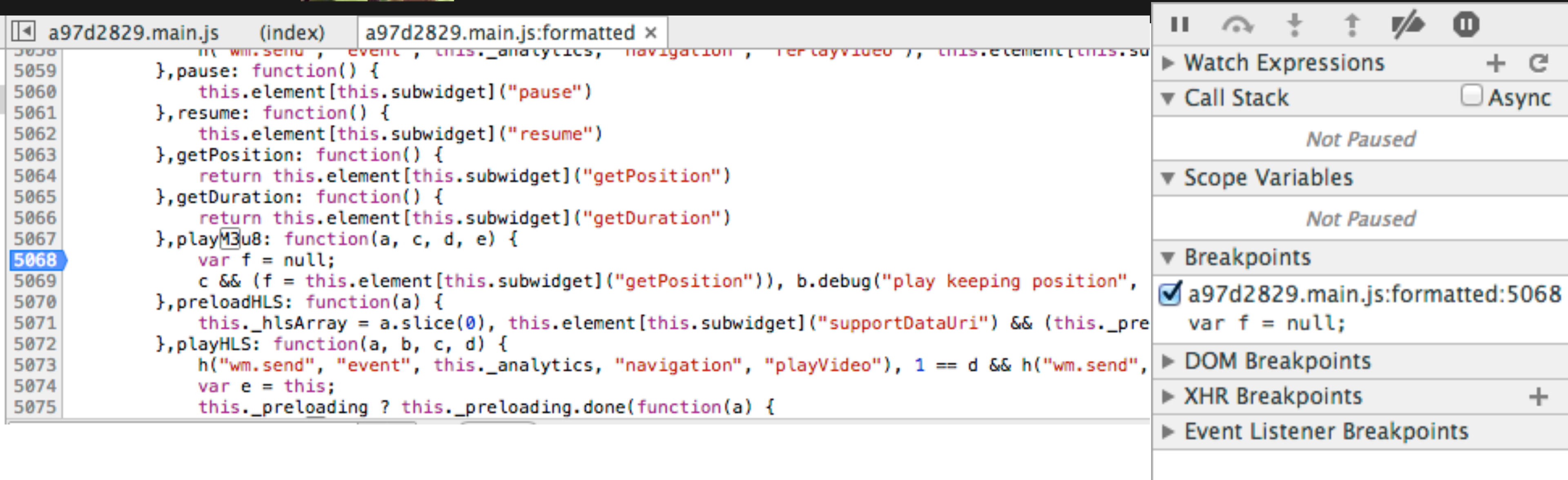


```
"main"@1 in group "main": RUN...
main():50, Reviews$
main():-1, Reviews
```

```
this = {Reviews$@984}
args = {java.lang.String[0]@989}
reviews = {ReviewServices@990}"ReviewServices(List(Venue(SAC'15 (SE),2015,30th ACM Symposium on Applied Computing - Software Engineering (SE) Track,KConference,PCMember,
   event = {scala.collection.immutable.$colon$colon@1168}"::" size = 33
journals = {scala.xml.Elem@991}"Elem" size = 1
   (0)  = {scala.xml.Elem@991}"Elem" size = 1
```

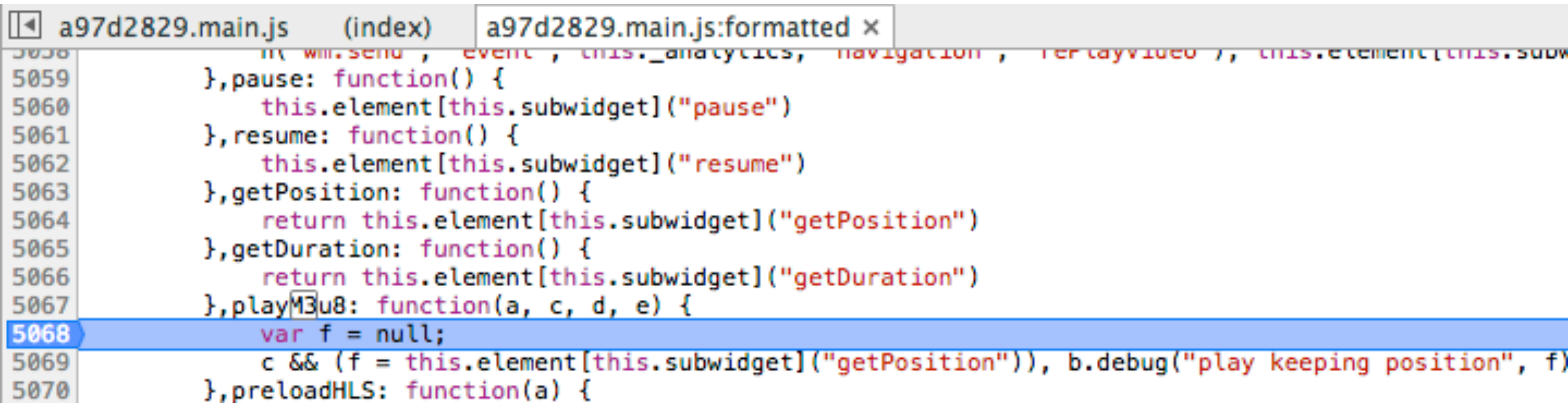

ETAPE 2 : CHOISIS 3 BONS SOUVENIRS

JE NE VEUX PAS CHOISIR
BURGER QUIZ
Jamel SHOW
C'ÉTAIT UN MESSAGE À CARACTÈRE INFORMATIF
LE DÉZAPPING DU BEFORE BEST OF



```
5059            },pause: function() {
5060                this.element[this.subwidget]("pause")
5061            },resume: function() {
5062                this.element[this.subwidget]("resume")
5063            },getPosition: function() {
5064                return this.element[this.subwidget]("getPosition")
5065            },getDuration: function() {
5066                return this.element[this.subwidget]("getDuration")
5067            },playM3u8: function(a, c, d, e) {
5068                var f = null;
5069                c && (f = this.element[this.subwidget]("getPosition")), b.debug("play keeping position",
5070            },preloadHLS: function(a) {
5071                this._hlsArray = a.slice(0), this.element[this.subwidget]("supportDataUri") && (this._pre
5072            },playHLS: function(a, b, c, d) {
5073                h("wm.send", "event", this._analytics, "navigation", "playVideo"), 1 == d && h("wm.send",
5074                var e = this;
5075                this._preloading ? this._preloading.done(function(a) {
```

☑ a97d2829.main.js:formatted:5068
var f = null;



```
5058                n( wm.send", "event", this._analytics, "navigation", "replayVideo"), this.element[this.subw
5059            },pause: function() {
5060                this.element[this.subwidget]("pause")
5061            },resume: function() {
5062                this.element[this.subwidget]("resume")
5063            },getPosition: function() {
5064                return this.element[this.subwidget]("getPosition")
5065            },getDuration: function() {
5066                return this.element[this.subwidget]("getDuration")
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5068                var f = null;
5069                c && (f = this.element[this.subwidget]("getPosition")), b.debug("play keeping position", f)
5070            },preloadHLS: function(a) {
```
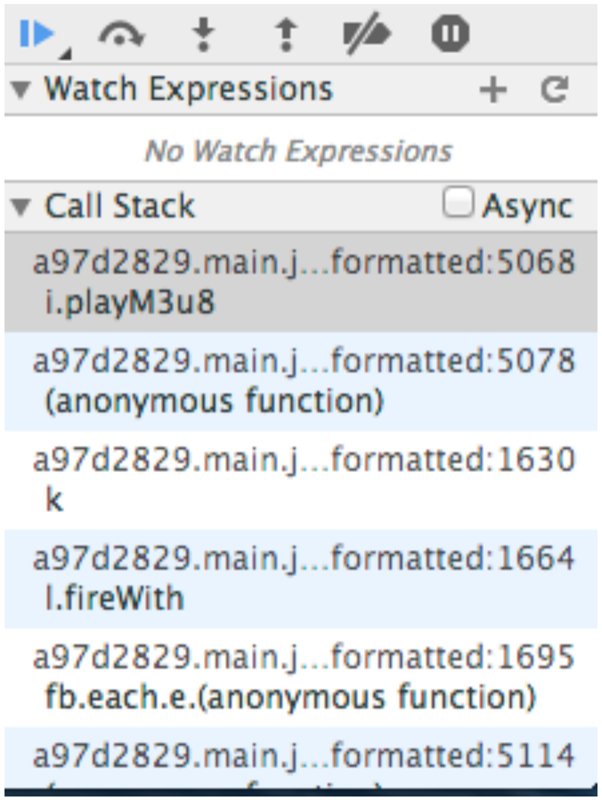
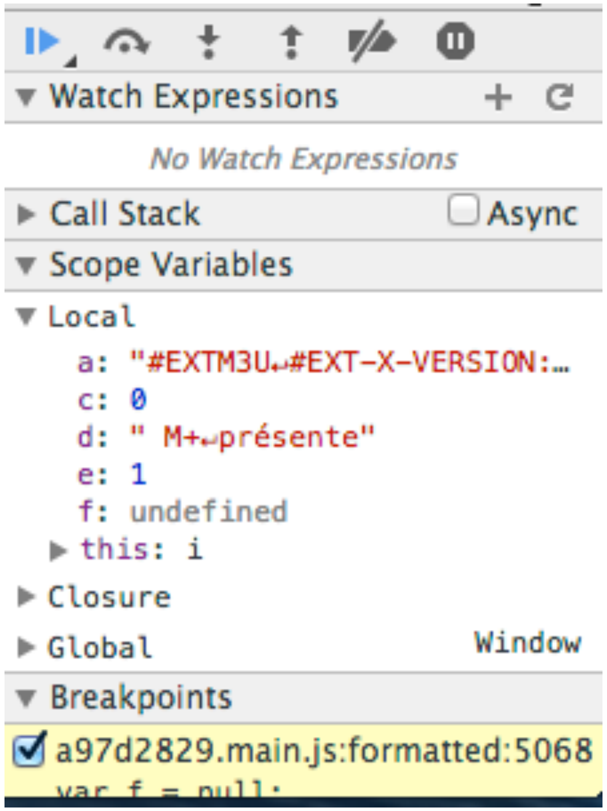



```
a97d2829.main.j...formatted:5068
 i.playM3u8
a97d2829.main.j...formatted:5078
 (anonymous function)
a97d2829.main.j...formatted:1630
 k
a97d2829.main.j...formatted:1664
 l.fireWith
a97d2829.main.j...formatted:1695
 fb.each.e.(anonymous function)
a97d2829.main.j...formatted:5114
```

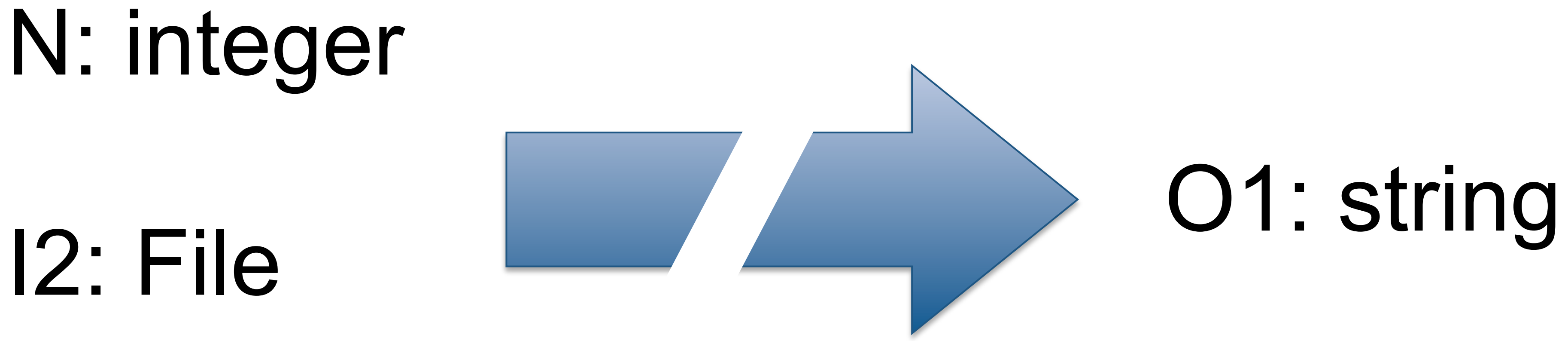


```
Local
  a: "#EXTM3U↵#EXT-X-VERSION:…
  c: 0
  d: " M+↵présente"
  e: 1
  f: undefined
▶ this: i
```

☑ a97d2829.main.js:formatted:5068
var f = null;

Profiling

- ~**Debugging** the, e.g., performance
  - Say the computation of term frequency takes 5 minutes (instead of a few seconds)



- Performance can be **tested** as well!

Logging

Logging, why? (claims)

- Logging is easier than debugging
- Logging is faster than debugging
- Logging can work in environments where debugging is not supported
- Can work in production environments
- Logs can be referenced anytime in future as the data is stored

Logging

- Logging is chronological and systematic record of data processing events in a program
  - e.g. the Windows Event Log
- Logs can be saved to a persistent medium to be studied at a later time
- Use logging in the development phase:
  - Logging can help you **debug** the code
- Use logging in the production environment:
  - Helps you **troubleshoot problems**

Logging Methods, How?

- The evil System.out.println()
- Custom Solution to Log to various datastores, eg text files, db, etc…
- Use Standard APIs
  - Don’t reinvent the wheel

Log4J

- Popular logging frameworks for Java
- Designed to be reliable, fast and extensible
- Simple to understand and to use API
- Allows the developer to control which log statements are output with arbitrary granularity
- Fully configurable at runtime using external configuration files

Log4J Architecture

- Log4J has three main components: loggers, appenders and layouts
  - Loggers
    - Channels for printing logging information
  - Appenders
    - Output destinations (console, File, Database, Email/ SMS Notifications, Log to a socket, and many others…)
  - Layouts
    - Formats that appenders use to write their output
- Priorities

Logger

- Responsible for Logging
- Accessed through java code
- Configured Externally
- Every Logger has a name
- Prioritize messages based on level
  - TRACE, DEBUG, INFO, WARN, ERROR & FATAL
- Usually named following dot convention like java classes do.
  - Eg com.foo.bar.ClassName
- Follows inheritance based on name

Logger API

- Factory methods to get Logger
  - `Logger.getLogger(Class c)`
  - `Logger.getLogger(String s)`
- Method used to log message
  - `trace(), debug(), info(), warn(), error(), fatal()`
  - Details
    - `void debug(java.lang.Object message)`
    - `void debug(java.lang.Object message, java.lang.Throwable t)`
  - Generic Log method
    - `void log(Priority priority, java.lang.Object message)`
    - `void log(Priority priority, java.lang.Object message, java.lang.Throwable t)`

Root Logger

- The root logger resides at the top of the logger hierarchy. It is exceptional in two ways:
  1. it always exists,
  2. it cannot be retrieved by name.

- Logger.getRootLogger()

Appender

- Appenders put the log messages to their actual destinations.
- No programatic change is require to configure appenders
- Can add multiple appenders to a Logger.
- Each appender has its Layout.
- ConsoleAppender, DailyRollingFileAppender, FileAppender, JDBCAppender, JMSAppender, NTEventLogAppender, RollingFileAppender, SMTPAppender, SocketAppender, SyslogAppender, TelnetAppender

Layout

- Used to customize the format of log output.
- Eg. HTMLLayout, PatternLayout, SimpleLayout, XMLLayout
- Most commonly used is PatternLayout
  - Uses C-like syntax to format.
    - `Eg. "%-5p [%t]: %m%n`
    - `DEBUG [main]: Message 1 WARN [main]: Message 2`

Log4j Basics

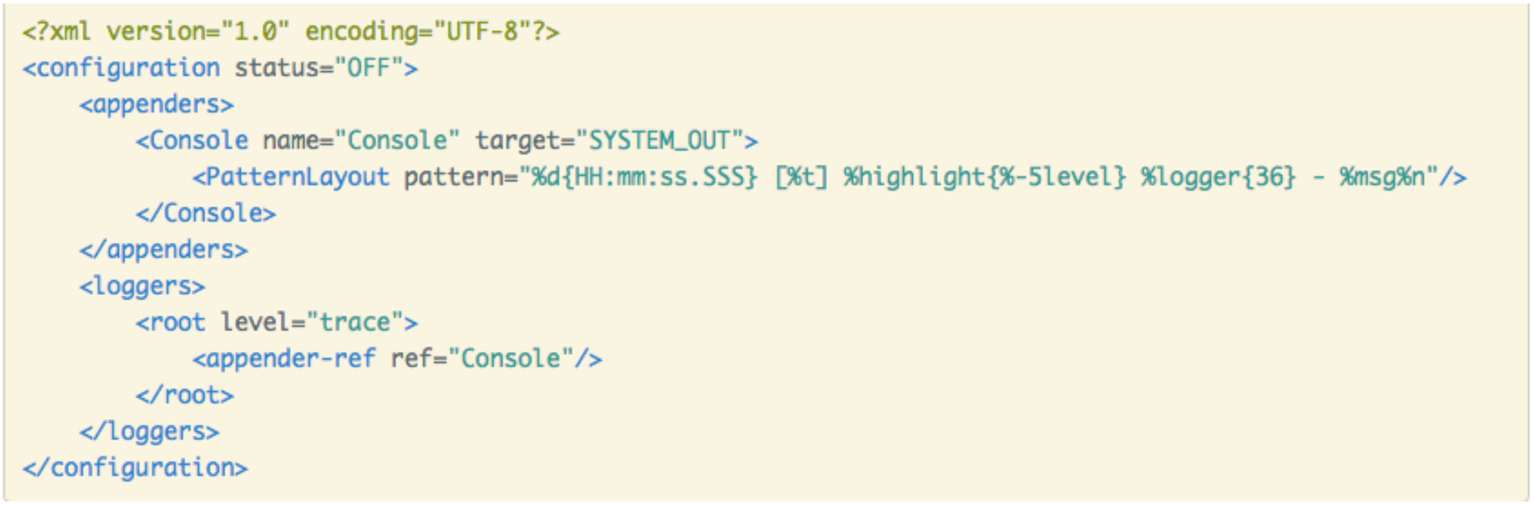
- Who will log the messages?
  - The Loggers
- What decides the priority of a message?
  - Level
- Where will it be logged?
  - Decided by Appender
- In what format will it be logged?
  - Decided by Layout

Log4j in Action

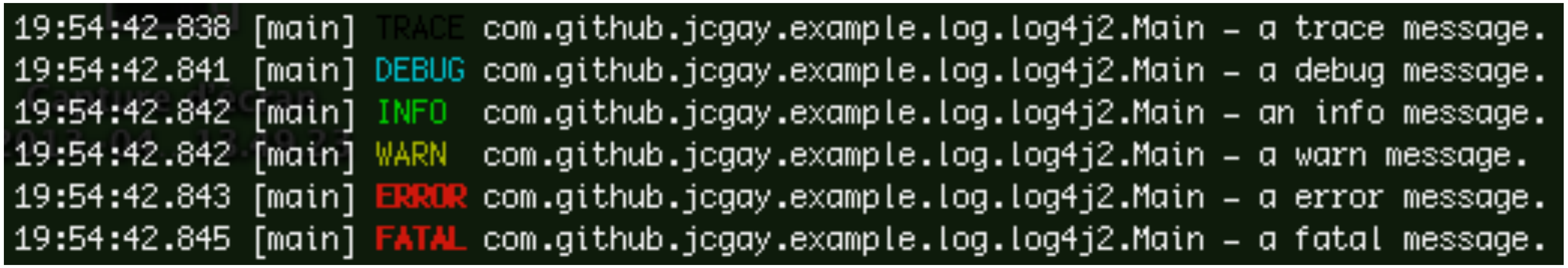
```
// get a logger instance named "com.foo"
Logger  logger = Logger.getLogger("com.foo");

// Now set its level. Normally you do not need to set the
// level of a logger programmatically. This is usually done
// in configuration files.
logger.setLevel(Level.INFO);

Logger barlogger = Logger.getLogger("com.foo.Bar");

// This request is enabled, because WARN >= INFO.
logger.warn("Low fuel level.");

// This request is disabled, because DEBUG < INFO.
logger.debug("Starting search for nearest gas station.");

// The logger instance barlogger, named "com.foo.Bar",
// will inherit its level from the logger named
// "com.foo" Thus, the following request is enabled
// because INFO >= INFO.
barlogger.info("Located nearest gas station.");

// This request is disabled, because DEBUG < INFO.
barlogger.debug("Exiting gas station search");
```

Layouts bis (eg colorizing Logs)

- http://logging.apache.org/log4j/2.x/manual/layouts.html
- http://jeanchristophegay.com/de-la-couleur-dans-les-logs/



```xml
<?xml version="1.0" encoding="UTF-8"?>
<configuration status="OFF">
    <appenders>
        <Console name="Console" target="SYSTEM_OUT">
            <PatternLayout pattern="%d{HH:mm:ss.SSS} [%t] %highlight{%-5level} %logger{36} - %msg%n"/>
        </Console>
    </appenders>
    <loggers>
        <root level="trace">
            <appender-ref ref="Console"/>
        </root>
    </loggers>
</configuration>
```



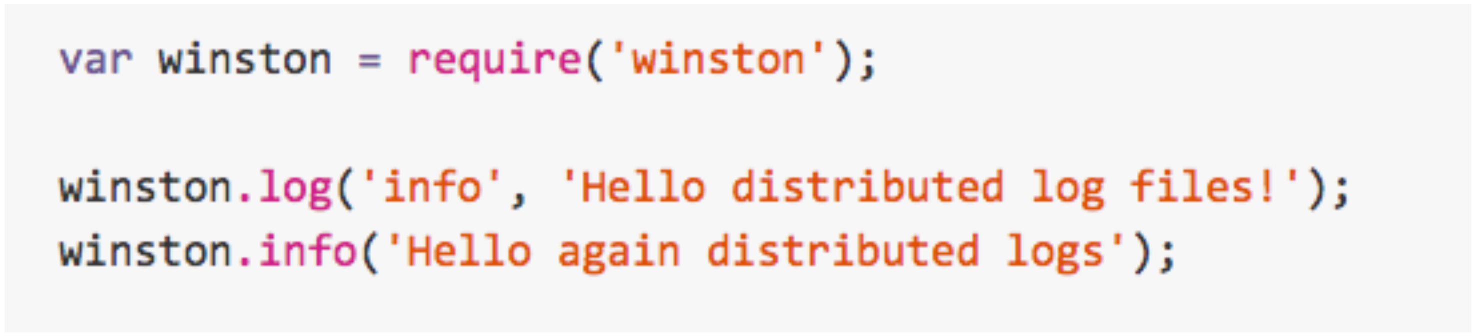
```
19:54:42.838 [main] TRACE com.github.jcgay.example.log.log4j2.Main - a trace message.
19:54:42.841 [main] DEBUG com.github.jcgay.example.log.log4j2.Main - a debug message.
19:54:42.842 [main] INFO  com.github.jcgay.example.log.log4j2.Main - an info message.
19:54:42.842 [main] WARN  com.github.jcgay.example.log.log4j2.Main - a warn message.
19:54:42.843 [main] ERROR com.github.jcgay.example.log.log4j2.Main - a error message.
19:54:42.845 [main] FATAL com.github.jcgay.example.log.log4j2.Main - a fatal message.
```

Log4j Optimization & Best Practises

- User logger as private static variable
- Only one instance per class
- Name logger after class name
- Don’t use too many appenders
- Don’t use time-consuming conversion patterns (see javadoc)
- Use Logger.isDebugEnabled() if need be
- Prioritize messages with proper levels

Logging in JavaScript / NodeJS

- Not only in Java!
- Alternatives also in other languages…
- https://github.com/flatiron/winston



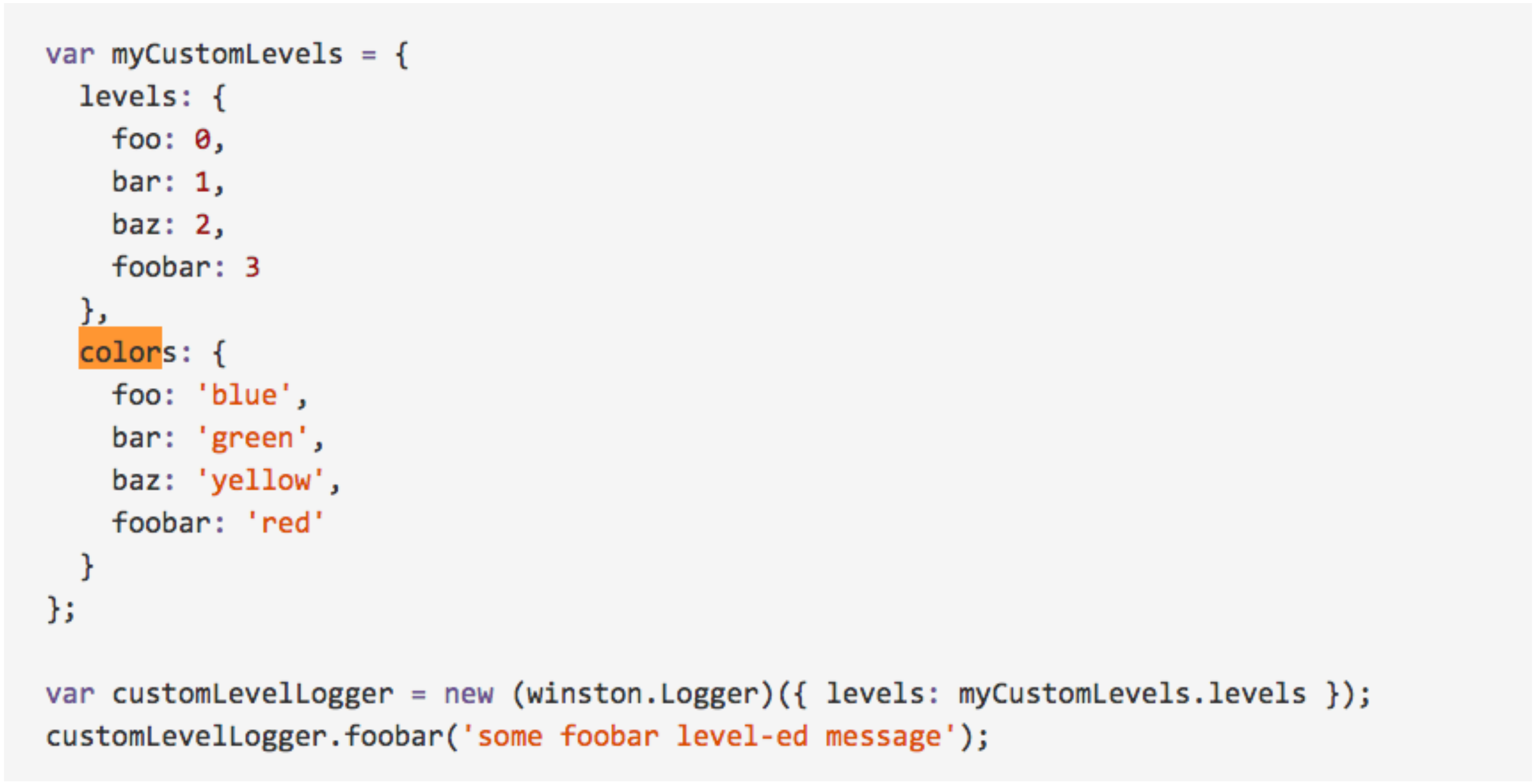
```
var winston = require('winston');

winston.log('info', 'Hello distributed log files!');
winston.info('Hello again distributed logs');
```

Using Logging Levels

Setting the level for your logging message can be accomplished in one of two ways. You can pass a string representing the logging level to the log() method or use the level specified methods defined on every winston Logger.

```
//
// Any Logger instance
//
logger.log('silly', "127.0.0.1 - there's no place like home");
logger.log('debug', "127.0.0.1 - there's no place like home");
logger.log('verbose', "127.0.0.1 - there's no place like home");
logger.log('info', "127.0.0.1 - there's no place like home");
logger.log('warn', "127.0.0.1 - there's no place like home");
logger.log('error', "127.0.0.1 - there's no place like home");
logger.info("127.0.0.1 - there's no place like home");
logger.warn("127.0.0.1 - there's no place like home");
logger.error("127.0.0.1 - there's no place like home");
```

Colorization (back)



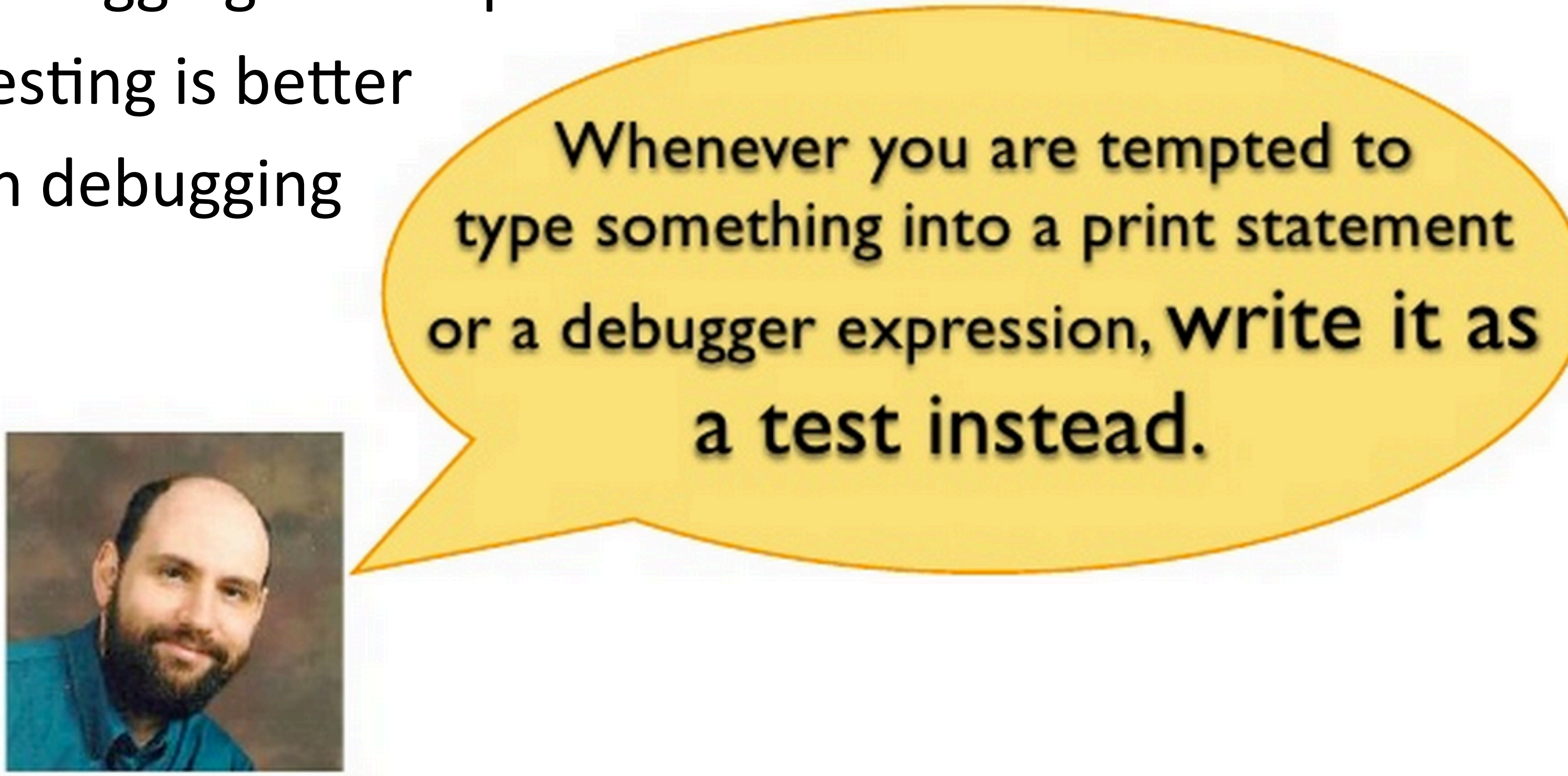
```
var myCustomLevels = {
  levels: {
    foo: 0,
    bar: 1,
    baz: 2,
    foobar: 3
  },
  colors: {
    foo: 'blue',
    bar: 'green',
    baz: 'yellow',
    foobar: 'red'
  }
};

var customLevelLogger = new (winston.Logger)({ levels: myCustomLevels.levels });
customLevelLogger.foobar('some foobar level-ed message');
```

You can’t test everything
(so one advice by Martin Fowler)

Whenever you are tempted to type something into a print statement or a debugger expression, **write it as a test instead.**

From Logging to Testing

- Testing: “the activity of finding out whether a piece of code produces the intended behavior”
  - Debugging can help
  - Testing is better
  than debugging

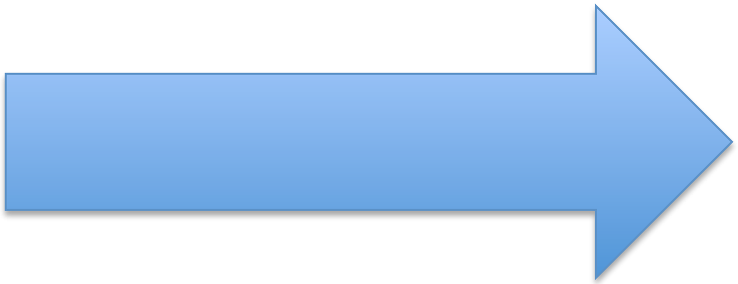

Whenever you are tempted to type something into a print statement or a debugger expression, write it as a test instead.

$$\begin{tikzcd}\text{Inputs} \arrow[r] & \text{Outputs}\end{tikzcd}$$

Logging (manual inspection of some values at specific points)

N: integer

I2: File

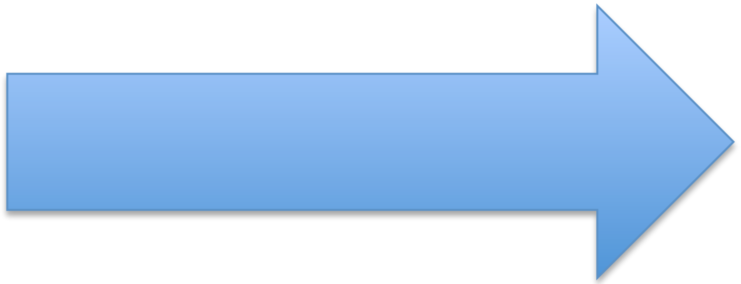


O1: integer

Debugging (manual inspection of values at some points)

N: integer

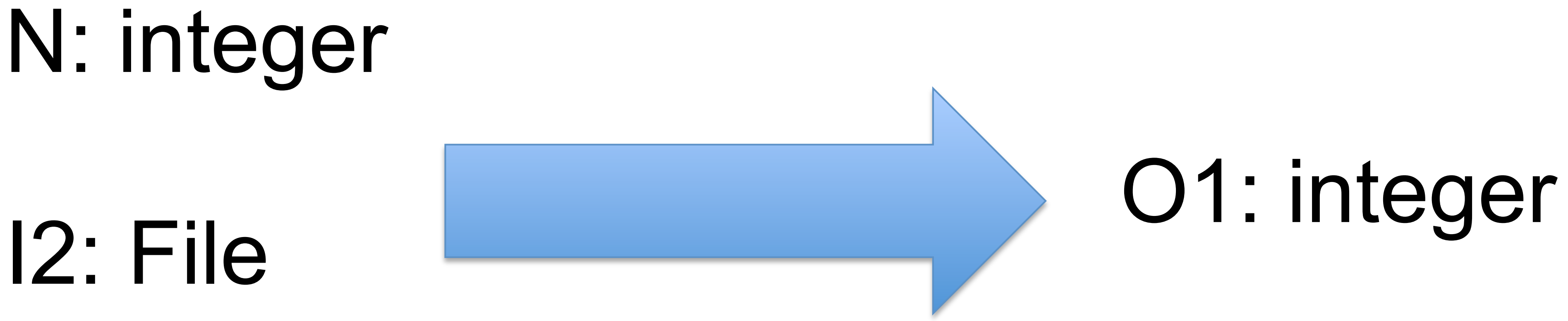
I2: File



O1: integer

Testing

(automated verification)



Testing

(automated verification)

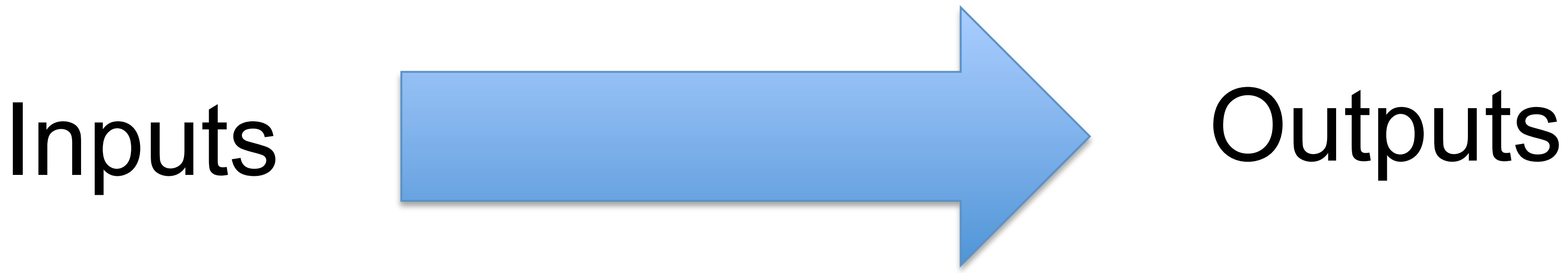
$$\begin{tikzcd}\text{Inputs} \arrow[r] & \text{Outputs}\end{tikzcd}$$

CONTROLLABILITY

ability to manipulate the software's input as well as to place this software into a particular state

OBSERVABILITY

deals with the possibility to observe the outputs and state changes that



TESTABILITY

degree to which a system or component __**facilitates the establishment**__ of test criteria and the performance of tests to determine whether those criteria have been met.

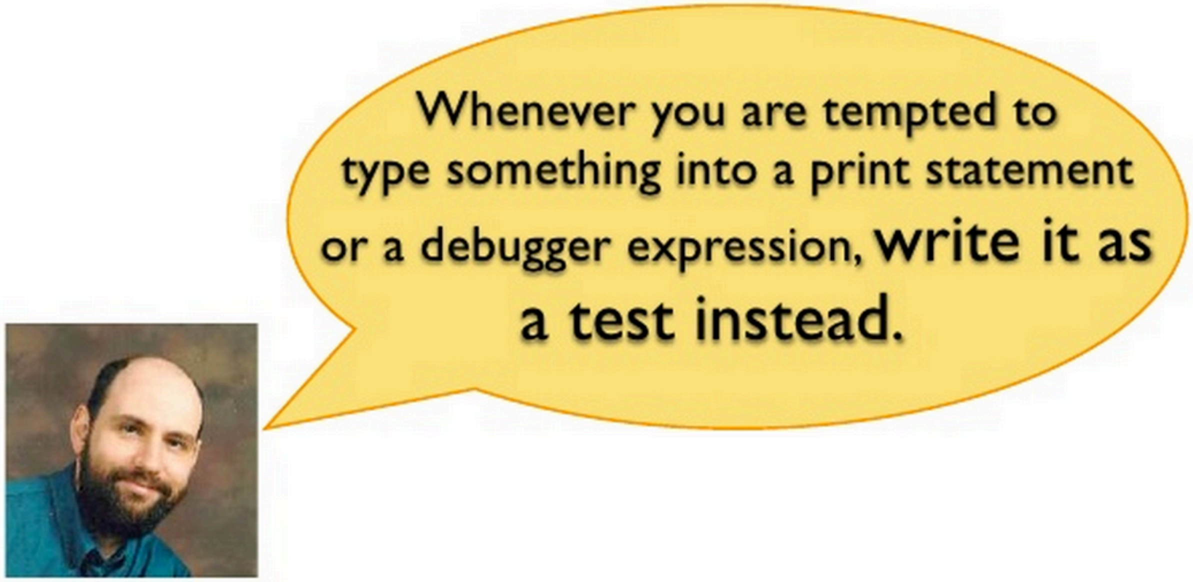
Controllability + Observability

$$\begin{tikzcd}\text{Inputs} \arrow[r] & \text{Outputs}\end{tikzcd}$$

Conclusion

- How to improve Testability?
  - Refactoring, Design patterns
  - Separation of concerns, Modularity, Abstractions

- Logging
- Debugging
- Testing


Whenever you are tempted to type something into a print statement or a debugger expression, write it as a test instead.

- Logging
  - Manual observation
  - (Usually) manual control on input values
  - Pre-defined exploration of values
- Debugging
  - Manual observation
  - (Usually) manual control on input values
  - Interactive, fine-grained exploration of values
- Testing
  - Automated control and observation (assertions)
  - More ameanable to re-executing on different inputs
  - Not to understand, but to verify some properties

Today

- Build System (maven)
- Manage your source code
- Refactoring
- Logging, Debugging and Test
- IDE (eg, Eclipse)
- Workflow: git, intégration continue, et tous les points ci-dessous

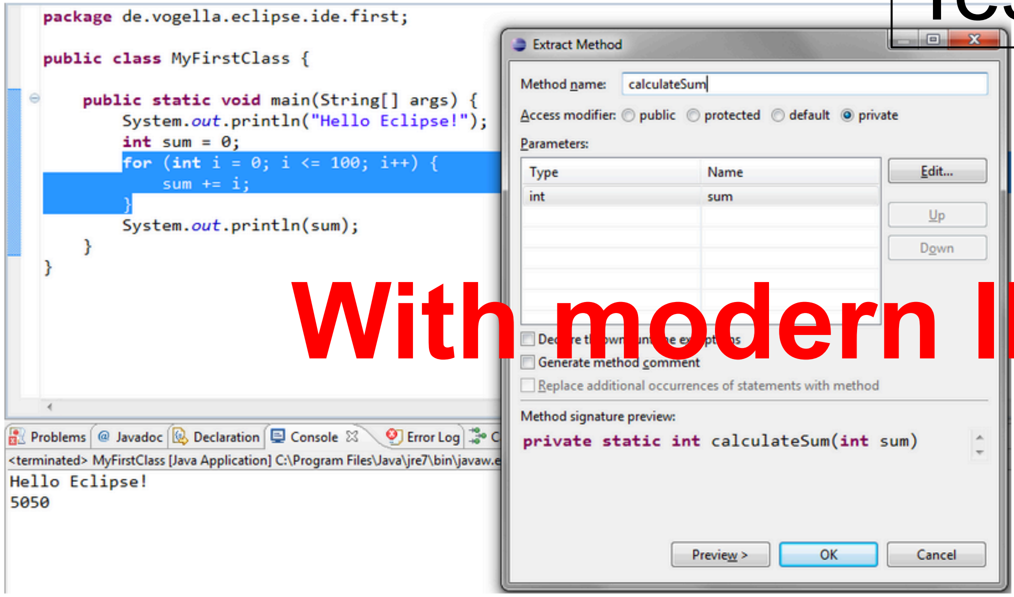
Document, refactor… Execute your tests… Debug.. Write test.. And so on!

Documenting

Debugging

Refactoring

Testing



```
package de.vogella.eclipse.ide.first;

public class MyFirstClass {

    public static void main(String[] args) {
        System.out.println("Hello Eclipse!");
        int sum = 0;
        for (int i = 0; i <= 100; i++) {
            sum += i;
        }
        System.out.println(sum);
    }
}
```

```
<terminated> MyFirstClass [Java Application] C:\Program Files\Java\jre7\bin\javaw.e
Hello Eclipse!
5050
```

Extract Method

Method name: calculateSum

Access modifier: public protected default [✓ private]

Parameters:

Type	Name
int	sum

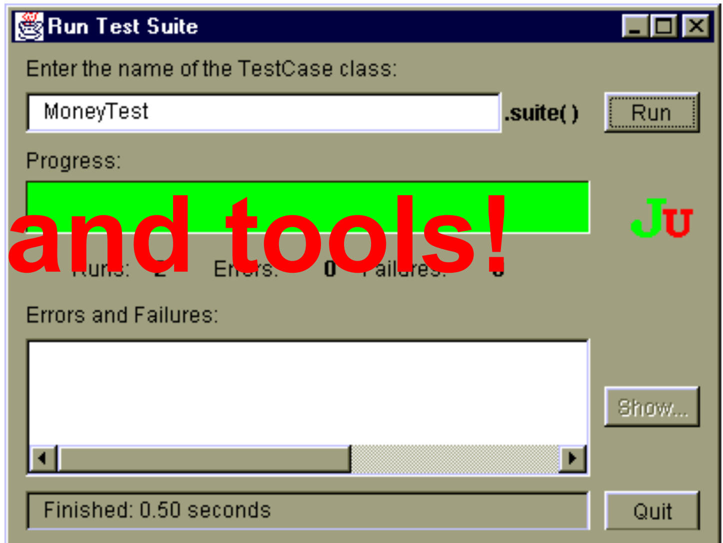
Declare thrown runtime exceptions

Generate method comment

Replace additional occurrences of statements with method

Method signature preview:

```
private static int calculateSum(int sum)
```



Run Test Suite

Enter the name of the TestCase class:

MoneyTest .suite( )

Progress:

Runs: 2 Errors: 0 Failures: 0

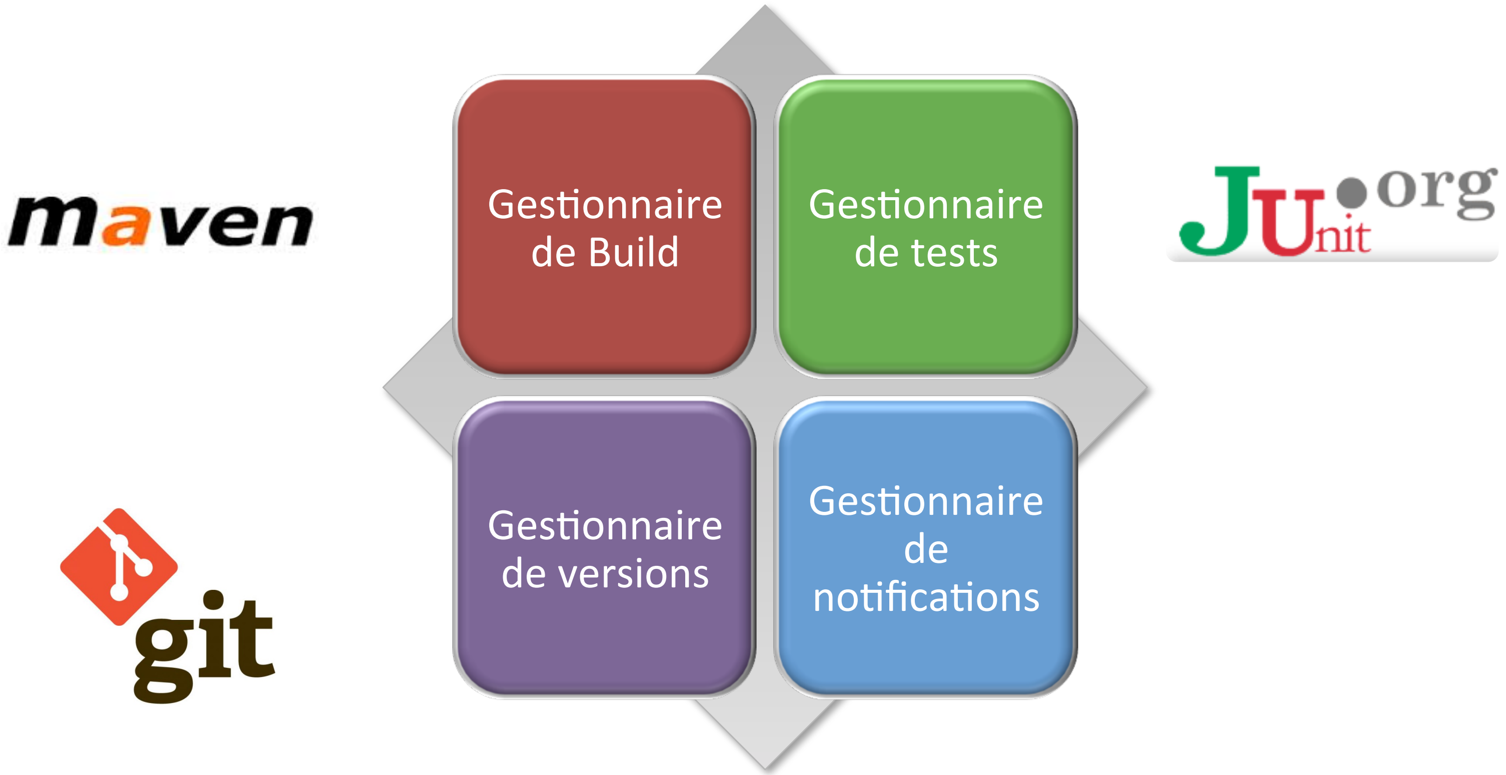
Errors and Failures:

Finished: 0.50 seconds

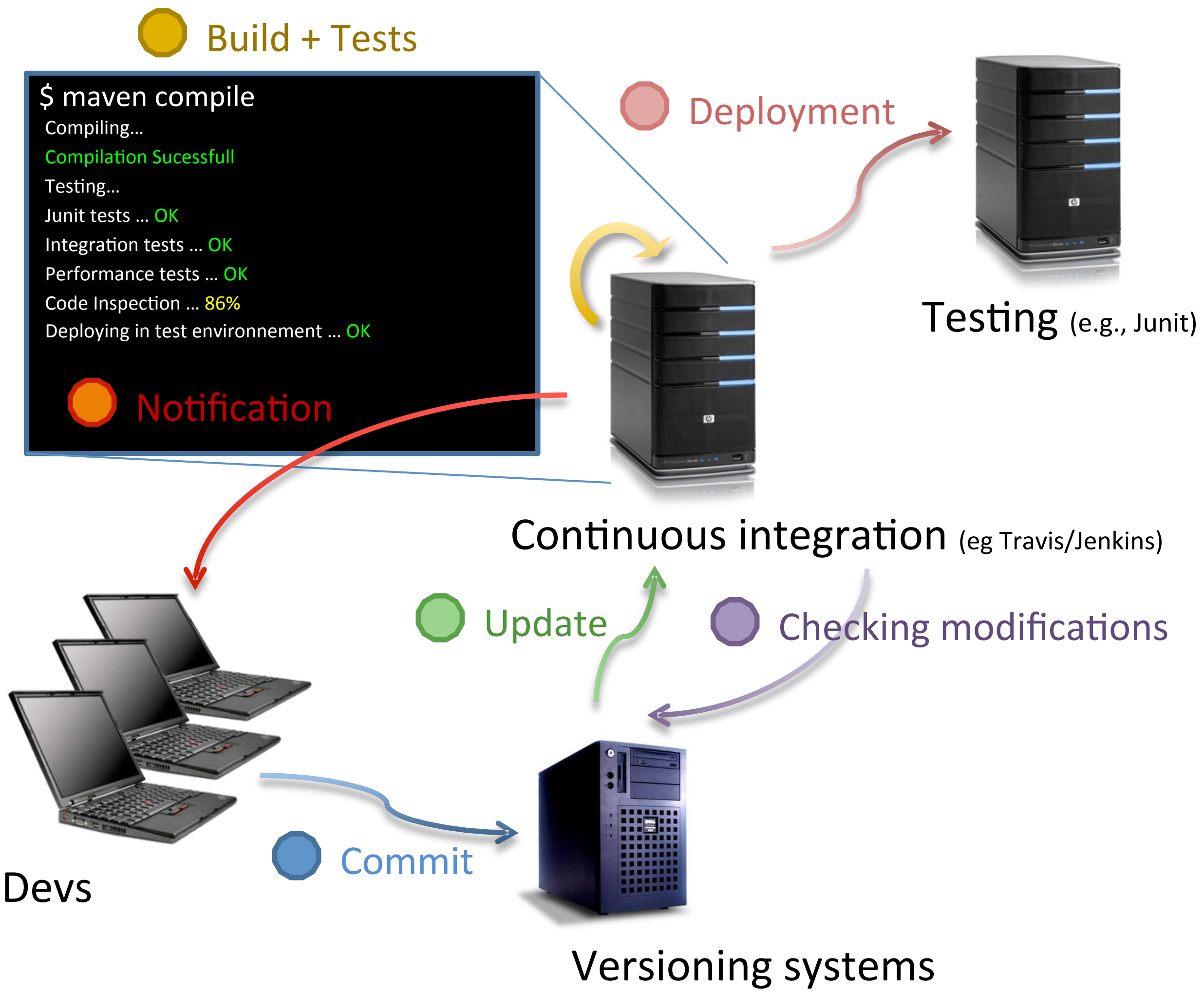
With modern IDE and tools!

Continuous Integration

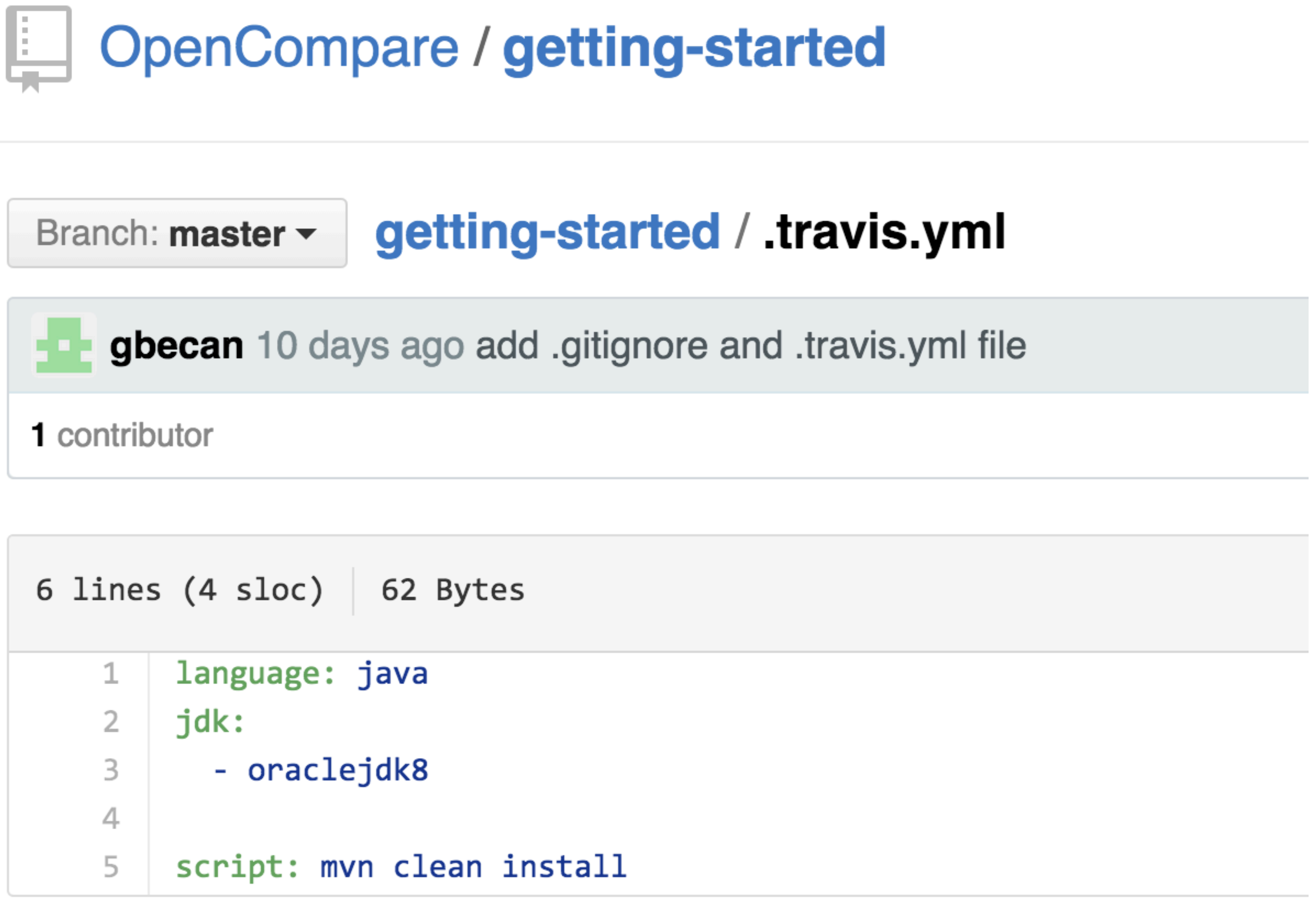
« L'intégration continue est un ensemble de pratiques utilisées en génie logiciel consistant à vérifier à chaque **modification** de code source que le résultat des modifications ne produit pas de **régression** dans l'application développée. »



Usage



```
$ maven compile
 Compiling…
 Compilation Sucessfull
 Testing…
 Junit tests … OK
 Integration tests … OK
 Performance tests … OK
 Code Inspection … 86%
 Deploying in test environnement … OK
```


OpenCompare / getting-started

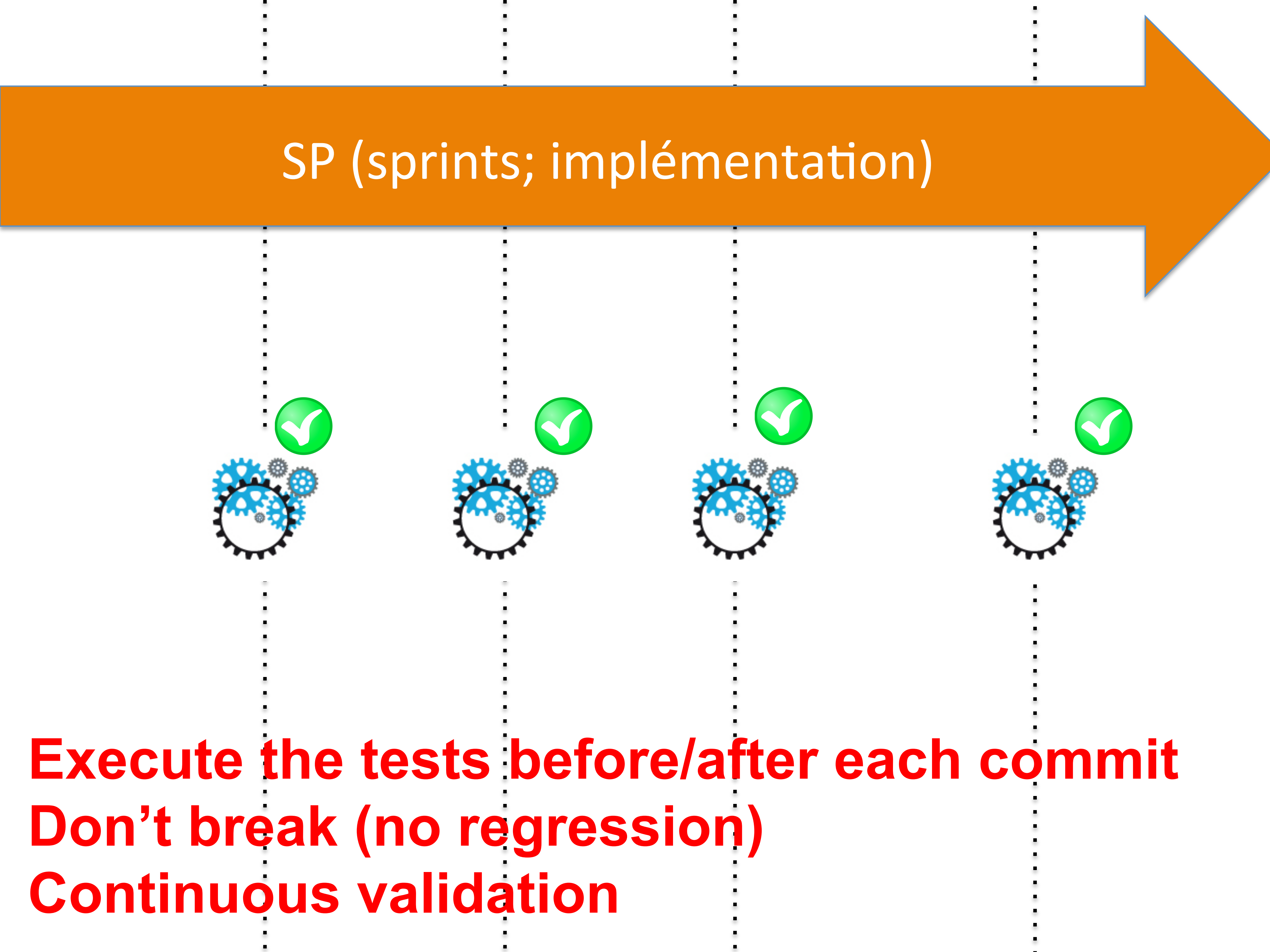
Branch: master ▾ getting-started / .travis.yml

gbecan 10 days ago add .gitignore and .travis.yml file

1 contributor

6 lines (4 sloc) | 62 Bytes

```
language: java
jdk:
  - oraclejdk8

script: mvn clean install
```



Execute the tests before/after each commit
Don’t break (no regression)
Continuous validation

Relationship with PDL (your project)

Impacts

- Use/experiment with all these tools
  - IDE in general (Eclipse, IntelliJ, etc.) and all services…
  - Debugging
  - Refactoring
  - Testing
  - Documentation
  - Maven
  - Versioning systems (git)
- You will have to in your professional career!